INVESTIGATING LEXICAL ACQUISITION PATTERNS: CONTEXT AND COGNITION

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Abstract

For the majority of children, lexical acquisition occurs quickly and efficiently. Specifying the necessary prerequisites to the acquisition of full meaning and the extent of the information acquired in both single and repeated exposures to establish a lexical representation is an essential element in understanding the acquisition process. The present research considers two types of prerequisites: child based factors and contextual factors. Two experiments were designed to assess the relative influence of these factors on acquisition patterns. In the first experiment child based factors (vocabulary knowledge, phonological memory, age) and different linguistic contexts for novel word learning are assessed. One hundred and ninety two children (3;6 - 4;6) were introduced to two novel words. The children in each condition were read two illustrated story books containing one unfamiliar word per story. After hearing the story, children's word knowledge was assessed on seven different lexical tasks immediately after the introduction and one week later. Correct responses were coded and an error analysis was performed to evaluate responses. Linguistic context, the child's chronological age and phonological memory differentially influenced performance across tasks. However, the findings of Experiment 1 were limited in the following ways: Firstly, the results about the role of children's existing vocabulary knowledge still remain inconclusive since children's performance across tasks was not found to differ significantly by their existing vocabulary knowledge. Secondly, Experiment 1 demonstrated children's word learning in a single assessment. Thus, they are limited in describing the lexical acquisition as a process over time.

The second experiment considers a) the child's baseline vocabulary knowledge, b) the impact of different sources of information and c) prior lexical knowledge and semantic domain, on the longitudinal acquisition of the new terms. One hundred and thirty children (5;00 - 6;00) were randomly allocated to five groups. Each intervention group was introduced to four target words through a series of controlled linguistic contexts over a period of four weeks. Immediately after each introduction, children's word knowledge was investigated on seven lexical tasks. Examination of the children's lexical representations took place over three consecutive periods. Group intervention, the baseline vocabulary and the nature of the target words differentially influenced performance across tasks. Implications of the results from both experiments for lexical acquisition processes are discussed.

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1.1 Introduction

The aim of the present research is to give some insight into the parameters related to the acquisition of new words from context. Its significance is in eliciting important parameters for lexical acquisition. The parameters to be investigated are child based factors, the nature of the lexicon as well as the nature of the input. Moreover, methodologically, the present research aims to demonstrate word learning through various lexical tasks which were devised particularly for the purposes of the present study.

In that way, the present research relates to some of the current theoretical models for lexical acquisition such as Sternberg and Powell's theory (1983) of word learning from context and Nelson's (1990) interactive functional model and aims to develop new key issues for word learning from listening to stories under the framework of the current models.

1.2 The problem

Words can be seen as the basic building blocks of language. The typical two-year-old child uses between 50 and 600 words (Bates et al, 1982) and adds an average of ten words per day to his/her vocabulary, resulting in a vocabulary of approximately 14,000 words by the age of six years (Templin, 1957; Carey, 1978). Once children enter school, they are exposed to 10.000 or more new words each year, and annually add 3,000 or so of these words to their vocabulary (Nagy and Anderson, 1984; Nagy and Herman, 1987). By the time an individual has graduated from high school, she/he is likely to know more than 50.000 words. The acquisition of words will not end during an individual's lifetime, so that an adult may easily have a vocabulary in excess of 100,000 words.

Vocabulary acquisition is an important factor for language development and later literacy skills. Higher level linguistic abilities such as language production and comprehension, reading and writing are unable to proceed adequately if a child has a poor knowledge of the meanings and sounds of individual words (Feitelson, Kita, & Goldstein, 1986).

The vocabulary growth occurring in school children is substantial and significant, and has received attention from a number of researchers (Beck, Perfetti, & McKeown, 1982; Graves, 1986). According to Wells (1986) vocabulary size is strongly correlated with children's overall school achievement. Because vocabulary plays an important role in both communication effectiveness and academic success, is important to understand how young children achieve their vocabulary growth.

In the early school years vocabulary is acquired incidentally in normal contexts such as story reading and oral lessons (Elley, 1989; Nagy, Anderson & Herman, 1987). However, a minority of researchers have examined how preschool age children acquire new lexical items through having stories read to them and which are the factors that influence the word learning process.

Those researchers claim that preschool age children learn new vocabulary through listening to stories. However, they come to that conclusion by measuring lexical acquisition through a single test such as the multiple choice test and without exploring the multifaceted nature of word learning (using multiple measurements) as well as the importance of other parameters for word learning.

The present research aims to investigate some of the important parameters for lexical acquisition from context through various lexical tasks in order to unfold the multifaced nature of word learning. The parameters to be investigated, in a series of two experiments, are child based factors, as well as the nature of the input and the lexicon. In that way the present research will evaluate some of the current theoretical models for lexical acquisition.

1.3 The structure of the thesis

This thesis is divided into eight chapters. Chapter 1 starts with an introduction to the thesis, raises the problem of the present research and concludes with the structure of the thesis. Chapter 2 includes a critical review of the literature on lexical acquisition. What is involved in the acquisition of word meaning, theories on how the word meaning is represented in the mental lexicon are discussed. The different capacities (linguistic, conceptual) which underlie the word learning process are also considered. The chapter concludes with a description of Sternberg's and Powell's (1983) theory of word learning from context.

Chapter 3 presents a discussion of relevant experimental studies for the role of input and other child based factors for lexical acquisition. Evidence from both traditional fast mapping studies as well as from more naturalistic situations such as listening to stories is discussed. Then, evidence for the role of child based factors such as phonological memory and existing vocabulary is discussed. The chapter concludes with a critical discussion on issues of assessing vocabulary knowledge. Chapter 4 develops the discussion of methodological issues and introduces the aims of Experiment 1. Then the pilot study for Experiment 1 is presented and the chapter concludes with implications from the pilot study and the rationale of Experiment 1.

Chapter 5 presents the aim, methods design and results of Experiment 1. In the first experiment child based factors (age, short-term phonological memory and existing vocabulary knowledge) and the nature of the input (single exposure to different linguistic contexts) for novel word learning were assessed. Children's word knowledge was assessed in seven different lexical tasks (particularly designed for the Experiment 1) immediately after the introduction and one week later. The different pre- and post- assessments measures are presented in the following table.

Table 1.1 Lexical Assessments used in Experiment 1

Pre-test measures	
1. The British Picture Vocabulary Scale BPVS	
2. The short term phonological memory test	
3. The target and control vocabulary pre-test	
Post-test measures	
Control vocabulary post-test	*Target vocabulary post-tests*
1.Multiple choice test	**1.** Naming task **2.** Inference task **3.** Analogy task **4.** Contrast task **5.** Multiple choice task **6.** Definition task **7.** Sentence generation task

Chapter 6 provides the rationale for Experiment 2. Chapter 7 presents the aims, method and results of Experiment 2. The second experiment considered additional child based factors (the child's general prior lexical knowledge and prior knowledge of the lexical items), the nature of the input in more naturalistic situations (repeated exposure to different sources of information) as well as the nature of the novel lexicon (semantic domain of the lexical items) on the longitudinal acquisition of the new terms. Children's word knowledge was investigated in seven lexical tasks, particularly designed for Experiment 2. Examination of the children's lexical representations took place over three consecutive periods. The assessments used during the pre- and post- test measurements are presented in the following table.

Table 1.2 Lexical Assessments used in Experiment 2

Pre-test measures	
1. Test of prior lexical knowledge	
2. The target vocabulary pre-test	
Post-test measures	
Control vocabulary post-test	*Target vocabulary post-tests*
1.Multiple choice test	**1.** Naming task **2.** Multiple choice task **3.** Association task **4.** Contrast task **5.** Definition task **6.**Short questions task (Categorisation and World knowledge questions) **7.** Story generation task

Chapter 8 gives an overview of the results from the present study and a general discussion of the findings in relation to the theoretical background and relevant experimental evidence. The chapter concludes with a proposal towards a model for lexical acquisition from context, implications of the present study for lexical acquisition, as well as the limitations of the current piece of work and suggestions for further research.

Chapter 2:

THEORETICAL FRAMEWORKS FOR THE ACQUISITION OF THE WORD'S MEANING

2.1 Prologue

The question of how children acquire natural language and particularly how they come to learn the meanings of the words has long occupied the central focus within the sciences of the mind. The present chapter discusses theoretical frameworks about the acquisition of the word's meaning. The chapter begins by describing what is involved in the acquisition of word meaning, and continues with discussing how different theories have approached the question of how the word meaning is represented in the mental lexicon. The different capacities which underlie the word learning process are also discussed. The chapter concludes with a theory of word learning from context.

2.2 What is involved in the acquisition of word meaning

Meaning is an important topic in any consideration of human communication since it is a prerequisite for understanding each other's speech. (Messer, 1994) suggests that the acquisition of a word's meaning differs from the acquisition of all the other aspects of language development such as acquisition of sounds, bound morphemes, syntax, manner that speakers of a language use to communicate. The unique characteristic of word's meaning development is that much of it occurs after other aspects of language development are more or less completed.

Kuczaj (1997) claims that the child needs to reach certain "knowledge sets" in order to acquire a word. Those sets could be summarised as follows: (a) Recognition of the word as a unit; (b) Identification of what is in a word's meaning; (c) Representation of a word's meaning in the mental lexicon. Each of the three knowledge sets is discussed in detail in the following sections.

2.2.1 Recognition of the word as unit

In the early periods of developing word meaning, the child may hear words used as single units, when for example a mother points to an animal and says dog. Tomasello and Farrar, (1986) found that the use of object names by mothers to refer to objects which are already in the child's focus of attention is positively correlated with later vocabulary size. Later on, children may be exposed to words as individual units at school, for example, when a teacher presents and defines terms such cell, nucleus etc. There are also other situations, for instance, when children read, they encounter words as isolated units on a page showing an image and labelling the part of a cell.

However, in situations like normal speech, words are part of the speech stream, and therefore must be separated. For the adults that seems an effortless process. Young children are first faced with the task of separating the spoken speech stream into words when they have little knowledge of their native language. It is difficult to explain how children extract individual words from the speech stream, but is assumed that they do, otherwise they could not learn so many words so quickly (Kuczaj, 1990). Probably they are helped in that task by their willingness to listen to human speech. Gibson and Spelke (1983) found that human infants prefer to listen to human speech rather than to other sounds in their environment. Nonetheless, the infant's preference for human sounds over other sounds does not explain the process by which children are able to segment the speech stream in the early phases of language development.

Different possible explanations may account for how children extract individual words from the speech stream. It may be that the child is born with that ability (Chomsky and Hale, 1968). However, this is not an explanation unless someone can specify exactly what is innate. Another possibility could be that children are driven to develop the ability to hear words as units by some innate factor (Chomsky, 1969). Nevertheless, in order for this possibility to be an explanation, the nature of the constraint must be specified. Another feasible solution could be that the environment leads children to distinguish one word from another (Kuczaj, 1990). All the above types of answer (innate ability, innate constraints and environmental influence) hold not only for explaining the ability to perceive words as separate units, but also as explanations of word meaning acquisition.

2.2.2 Identification of what is in a word's meaning

According to Carey (1978) children must learn at least four things in order to acquire the meaning of a word, which are the following: (1) the pronunciation of the word, (2) the syntactic properties of the word, (3) the meaning of the word and (4) how the word is used to communicate one's intended message. All this information is stored in the lexicon.

In order for the child to complete the acquisition process, the relevant information about words (pronunciation, syntax, meaning, communication of the message) must be represented in the mind. The mental lexicon consists of these representations. There have been several attempts to determine the nature of the representation, by scientists from different fields, such as, philosophers, linguists and psychologists. An interesting attempt was offered by Lyons (1977) who proposed a distinction between reference, denotation and sense, as an attempt to characterize meaning.

Reference of a word is the thing or the things picked out by the word on a particular occasion of use. For example, the word dog in the sentence "The black one looks mean", in a situation in which there are several dogs, one of which is black (Anderson et al.1991).

Denotation indicates the entire class of entities associated with a word. Denotative meaning is the type of meaning involved when words are used to refer to something, such as an object, some property of an object, some action, or a hypothetical idea. For example, the denotative meaning of furry has to do with the hairy properties of certain objects, the denotative meaning of walk has to do with an activity that certain objects perform, and the denotative meaning of unicorn has to do with certain fantasy objects (Anderson et al. 1991).

Sense differs from denotation and reference because it does not relate words to entities (objects, events, speakers, listeners, etc.) that are outside the mental lexicon. Sense describes the ways in which words are related to one another in the lexicon, for instance the relation of the word dog to animal.

Dockrell and Campbell (1986) proposed that the distinction between reference, denotation and sense can provide a framework for the study of the word meaning acquisition. In the next subsections, each of these aspects is discussed.

Reference

Words are arbitrary conventional symbols (Kuczaj, 1996). They are arbitrary because there is no inherent relation between a particular sound pattern (word) and its meaning. For example, the sound pattern elephant carries no necessary relation to the pachyderms associated with the term. If there were some necessary relation between words and meanings, all languages would use the same words. Instead different languages use different sound combinations to refer to the same meaning. The English dog is hund in German, perro in Spanish, chien in French and skelos in Greek.

Words are conventional because the relation between words and meanings is implicitly agreed upon by the speakers of a language. Although the relation between the word elephant and its meaning is arbitrary, speakers of English agree about the relation. It is this agreement that makes words conventional symbols, and makes communication possible. Words are symbols because they represent meanings. The word dog represents dogs, but the word dog is not itself a dog. In general, regardless of their meaning(s) all words are symbols (Harnad, 1996).

Kuczaj (1988) argues that children recognize the difference between words and objects from the very beginning of the word meaning acquisition process. This capacity does not emerge in full bloom, but is instead initially highly contextually dependent. In this view, children never equate words and objects, because they know from the beginning that words are used to label things.

Denotation

When children first produce words that they hear, they must determine the denotation of each word that they learn. How do children decide exactly what particular words denote? Certainly, children must depend on contextual information to interpret words. According to Kuczaj (1975, 1982) the manner in which a child interprets a word depends on the child's existing lexicon, knowledge of the world, and cognitive skills.

The child's interpretation and memory of the situation in which the word was first encountered will determine the child's initial guess about the word's denotation. This requires the child to be an exceptional information processor. He/she must interpret, organize, store and retrieve vast amounts of information about words.

Regardless of whether or not a new word has a concrete referent, children may make a quick guess about a word's denotation, often on the basis of limited experience, a phenomenon which is called "fast mapping" (Carey, 1978; Dockrell and Campbell, 1986; Heibeck and Markman, 1987). For example, if a child is first exposed to the word beige in the context of instruction "bring me the beige one, not the blue one", the child might conclude that beige is a colour term and that it is a colour other than blue (Carey and Bartlett, 1978).

Sense

Frege's (1892) classic example, which is frequently used in discussions of sense and reference, is the following: "The Morning Star is the Evening Star". As Frege pointed out, the two expressions "The Morning Star" and "the Evening Star" have the same references (Bedeutung), since they each refer to the same planet. But they can not be said to have the same sense. If they did they would be tautologous for example "The Morning Star is the Morning Star".

The sense relationship is said to hold between the words or expressions of a language (Lyons, 1977). For example, "Unicorn" has meaning, not because of its denotation, but because of its relationship with other elements in a particular semantic field, for example animals. In other words, sense has to do with the semantic relationship between the words.

Words for objects: Overextension and Underextension errors

Words that denote objects have received the greatest amount of concern from researchers of word meaning acquisition. Different reasons can explain that interest. Firstly, object words have been perceived to be very important in the early phases of the development of lexicon (Tomasello and Merriman, 1995). However, recent research (Tardif, 1996) has demonstrated that the above finding is not evident across languages. Tardif (1996) found that verbs or action words were more prevalent in Mandarin speaking children. Secondly, it is relatively easy for the researchers to assess the denotation that a child has granted an object word than an abstract word or a verb.

The early phases of word meaning acquisition demonstrate that children's initial guesses about the denotation of words are often partial. A child may attach an overly broad denotation to a word. For example, a child may use a word like dog to denote dogs, cows, sheeps, and bears. Such a mistake is called an overextension error. On the other hand, a child may attach too narrow a denotation to a word, and so restrict a word. For example, a child may use a word like "man" only to his/her father. This is known as an underextension error.

These sorts of errors illustrate the fact that children must constantly refine the meanings that they attach to words until they determine the appropriate conventional meaning. Kuczaj (1986) has suggested that young children might learn object words in the following sequence:(1) The word is underextended; (2) The word is underextended and overextended (e.g. only some dogs are called dog, but some non-dogs are also called dog); (3) The word is overextended; (4) The word is used correctly. According to Kuczaj's (1986) data, sometimes the first and third steps need not occur in the acquisition of every early object word, but if the steps did occur, the sequence outlined above is sustained.

Different studies have shown that overextension errors occur in comprehension as well as in production (Thompson and Chapman, 1977; Kuczaj, 1983; Mervis and Canada, 1983; Kuczaj, 1986). This may suggests that overextension errors may reflect the denotation of words for children and have implications about how the denotation of object words may be represented in their minds.

2.2.3 Representation of word's meaning in the mental lexicon

An adequate theory of how children learn the meanings of words such as *cats* and *taking* requires some account of what it is to possess the corresponding concepts of CATS and TAKING. In accordance with Messer (1994) the term concept will be used to refer to the representation of a group of entities which are considered to be similar. For example, we have certain ideas about the characteristics that are necessary to identify the category "*bird*" such as flying, having wings, having a certain anatomical structure, etc. However, the concept of BIRD can be considered to include additional information that is not necessary to identify birds. For example, the way they fly in different circumstances, where they build their nests etc. Thus, a concept contains idiosyncratic and general knowledge about an entity, whereas a category simply contains the information necessary to identify an entity as being a member of a class.

The process of forming concepts is very complex. How does a child manage to understand that dogs, which share many characteristics with cats, are indeed a different group of animals ? Various theories which attempted to offer a description of the category structure and the formation of concepts are discussed in the following sections.

2.2.3.1 Category structure

2.2.3.1.1. The Classical View Theory

The classical view theory of concepts assumes that mental representations of categories consist of a summary list of features that individually are necessary for category membership and collectively are sufficient to determine category membership (Lakoff, 1987; Armstrong, Gleitman and Gleitman 1983). For example, the category "triangle" meets these criteria. All triangles are closed geometric forms with three sides and interior angles that sum to 180 degrees. To see if something is a triangle one has only to check for these properties, and if one is missing, one does not have a triangle (Medin, 1989).

There is evidence that people can treat concepts in ways which agree with the classical view (Bruner et. al. 1956). However, Bruner's et. al. work was carried out in a domain of fairly artificial categories. This view does not apply to natural categories which appear to categorize entities according to a set of necessary and sufficient conditions. Also, some other serious problems with the classical view, are that it fails to specify defining concepts eg. someone may list "made of wood" as a necessary property for violins, but not all violins are made of wood.

2.2.3.1.2 The Probabilistic view theories

The rejection of the classical view of categories has been associated with the ascendance of the probabilistic view of category structure by Wittgenstein (1953). The term probabilistic view, seems to imply that people organize categories via statistical reasoning (Oden & Lopes 1982). Probabilistic view categories are organized according to a family resemblance principle. That principle holds that categories are fuzzy or ill-defined and that they are organized around a set of properties or clusters of correlated attributes that are only characteristic for category membership (Rosch, 1978).

According to family resemblance relationship, each member of a category has at least one, and probably several, attributes in common with one or more members, but that no or few attributes are common to all members of the category (Rosch and Mervis 1975; Mervis & Rosch, 1981). Rosch and Mervis (1975) provided considerable empirical support for this position for natural concepts (e.g. colours). In its place a new way of explaining category formation, was provided - what Rosch has termed the theory of prototypes and basic level categories. A prototype is a representation which captures many of the common features of a group, and can be used to decide category membership (Rosch, 1978; Rosch, Mervis, 1975; Rosch, Mervis, Gray, Johnson, 1976; Smith, Medin, 1981).

Rosch & Mervis (1975) suggest that word meaning is not specifically tied to clear definitions. Instead the referents of a word may share some but not all of a set of common features. For example, penguins which belong to the category of birds have feathers and lay eggs, but unlike many birds they swim underwater and cannot fly (Lakoff, 1987; Eysenck & Keane, 1990).

According to Rosch et. al. (1976) the majority of everyday concepts can be organized into hierarchical classification schemes. Rosch (1978) considers the category system as having both a vertical and a horizontal dimension. The vertical dimension involves the level of inclusiveness of the category, for example the way in which the categories of collie, dog, and mammal differ. The horizontal dimension involves the differentiation of categories at the same level of inclusiveness, for example what differentiates dog, car, bar.

Rosch et. al. (1976) suggested that there are three levels of categorization: the basic, superordinate, and subordinate level. Basic level of categorization is the level at which there is a large gain of distinctiveness relative to the category above, but only a small loss relative to the category below. The level above is called superordinate and the level below subordinate. For example, animal belongs to the superordinate category, dog belong to basic level and collie to the subordinate level.

During the last twenty years, various attempts have been made to explain object word meaning acquisition in terms of prototype- based denotation (Anglin, 1977; Barrett, 1982, 1986; Greenberg and Kuczaj, 1982; Kuczaj, 1982, 1986; Tager-Flusberg, 1986). It has been demonstrated experimentally that children in certain tasks choose more prototypic objects before less prototypic ones (Kuczaj, 1982; Tager-Flusberg, 1986). Although, the notion of some prototype-based representational system for object word denotation seems justified by the data, the precise nature of the prototype representational system, has not yet been specified.

A more radical principle of mental representation, which is also consistent with fuzzy categories is the exemplar view (Leddo, Abelson, Gross, 1984; Nokofsky, 1988; Smith & Medin, 1981). The exemplar view denies that there is a single summary representation and instead claims that categories are represented by means of examples.

However, it can be argued that both prototype and exemplar theories rely on roughly the same similarity principle. That is, category membership is determined by whether some candidate is sufficiently similar either to the prototype or to a set of encoded examples. Similarity in that case is based on matches and mismatches of independent features (Leddo, Abelson, Gross, 1984; Medin & Ortony, 1989; Medin 1989).

With reference to the first type of probabilistic views - prototypes theory- although the general idea that concepts are organized around prototypes remains popular, at a more specific empirical level, prototype theories have not fared very well. Prototype theories imply constraints that are not observed in human categorization (Medin & Schwanenflugel, 1981; Kemler-Nelson, 1984). They also predict insensitivity to information that people readily use (Estes, 1986), and fail to reflect the context sensitivity that is evident in human categorization (Roth & Shoben, 1983; Medin & Shoben, 1988). Thus, there is a shift again to the role of knowledge structures and theories in categorization. The Semantic Feature Hypothesis which follows next shows a change at the level of analysis.

2.2.3.2 The formation of concepts

2.2.3.2.1. The Semantic Feature Hypothesis

Clark (1973) proposed the Semantic Feature Hypothesis. She argued that the meanings of the words are analysed into smaller elements-semantic features. For example, the meaning of the word father could be broken down to male, adult etc. According to that theory, the child gradually learns the meaning of a word by learning the set of features that characterizes a word's meaning. To identify the category of a word, Clark hypothesized that children simply attach a single semantic feature to a word they hear, and the semantic feature is usually perceptual in nature. An example she uses, is that when children hear the word dog they choose a semantic feature like four legged as being the definition of a word dog. Therefore, the child would treat the word dog as meaning four legged, and be unaware that the word has other additional meanings.

The theory was able to explain the overextensions (when children apply a word to inappropriate referents) and underextensions (when children restrict a word's use to a subset of the adult's category in children's speech). Such mistakes are predicted by the Semantic Feature Theory. Thus, in the example with the word dog this would be expected to be applied to a variety of four legged animals (sheep, cows, cats). The theory was also able to explain later confusions in children's speech. Children when learning contrasting words like more / less, high / low, in / on, seem to know what the relevant dimension of the word is (quantity, height, position) but will usually acquire the positive expression before the negative one (i.e. more before less). The semantic feature hypothesis predicts that children first acquire what could be considered the more simple dimension (e.g. the positive dimension).

Nevertheless, Clark's theory was criticized for the lack of specification of what constituted semantic features and how they could be defined (Richards, 1979). For example, Clark supposed that children are able to choose a semantic feature (e.g. four legs) that is a relevant characteristic of a group of entities (e.g. dogs). However, it is not enough to say that children simply see that dogs have four legs and so they assume that the word dog refers to all animals with four legs. Any theory has to explain why a child chooses to form a concept based on the characteristic of having four legs from all the perceptual possibilities that are available. Therefore, there is a real problem of explaining how children break into what appears to be a circular process.

2.2.3.2.2 Functional Core Theory

Nelson (1974) proposed the Functional Core Theory. She supposed that the development of a new concept begins with the first experience of a new object. That provides a set of relations which an object has with other entities (e.g. a book may be held by a child, may be positioned on the bookshelf or on the table). Once a list of functions has been identified, then other objects which possess the same characteristics are categorised as belonging to the same concept. With experience, a refinement of the functional core happens and irrelevant dimensions are discarded. Nelson suggested that children identify the perceptual characteristics of an object, as concepts being formed (e.g. balls are round, coloured, smooth etc). That makes them able to recognise new instances of a concept without having to see the functional use made of the object.

Nelson like Clark hypothesized that children have already formed concepts about objects in the world, before they acquire the words. Words are acquired by children, understanding that a word is constantly associated with a particular concept. Then, they assume that the word refers to the existing concept of that object, and the word would take on that meaning. Although, sometimes there are cases where the child's and the adult's meaning would not correspond, with experience, children's meanings would undergo modification.

Nelson's theory was criticised for not being able to deal with the way children break into the circular processes of needing to have a concept to identify relevant attributes, and needing to identify relevant attributes to form a concept (on the same grounds, Nelson criticised the semantic feature theory). Children in that case have to categorise objects according to their functional similarity, and they still have to identify what are the similar features of different examples of the same function. In Bowerman's (1978) example, "chairs" might be identified by the act of sitting, but there are many ways of positioning oneself on chairs: kneeling, lying, etc.

Another criticism is dealing with the fact that overextension usually occurs on the basis of perceptual rather than functional characteristics (Bowerman, 1978). Children will often overextend a word on the basis of perceptual characteristics such as shape, for example, calling all round objects "ball". Bowerman (1978) found that overextension sometimes occurs with little or no regard to the functional relationships between the objects. Additionally, although Nelson predicted that names would first be used in a functional context, Bowerman found that words were sometimes first said when an object was not involved in a functional relationship with the child.

2.3 Different capacities underlie the word learning process

To give some idea of what a formidable task children face in acquiring a lexicon, consider the fact that adult English speakers' production vocabulary is between 20,000 and 50,000 word forms, while comprehension vocabulary is considerably larger. In the case of young children, some estimates suggest that from the age of two onwards, children on average master around 10 new words a day to arrive at a vocabulary of about 14,000 words by age of six. Growth in vocabulary from then on to about age seventeen averages at least 3,000 new words a year. The number of words and meanings that children acquire is phenomenal.

How, though, do children go about this task ? Quine's argument is that there is always more than one hypothesis for the meaning of a new term which is consistent with the present evidence. A well-known example being proposed by Quine is to imagine that a linguist visits an unknown country and attempts to learn the native language. When a rabbit passes a native says,"Gavagai". How is the linguist to figure out what "Gavagai" means? There are many hypotheses for "Gavagai" to refer to "white" or "furry" or "medium-sized" or "rabbit" or "rabbit next to the tree" or "the rabbit and its carrot" (Markman, 1989). To identify possible words of their language, they must isolate word forms. They must also identify candidate meanings. And they must link the two together in setting up lexical entries in their mental lexicon.

Young children beginning to acquire the lexicon face the same problem as Quine's. Despite these complexities, children of two years and over, acquire a very large vocabulary very fast. In recent years, to investigate how children acquire new words, researchers have used methodologies employing the introduction of novel words. The term novel in most instances implies either nonsense words created by the examiner, or real but unfamiliar words. When encountering a novel word children have been shown to use a strategy called "fast mapping" to help them infer the meaning of the word.

Fast mapping is the term coined by Carey and Bartlett (1978) to refer to the rapid acquisition of information about a word during the first few encounters with it. In one study, when three-year-olds heard an unfamiliar word form *chromium*, alongside other words for colour, they assumed that it picked out a colour. They did this on the basis of hearing the new word only once or twice (Carey, 1978, Carey and Bartlett, 1978).

Children's willingness to assign some meaning to a new word-form after hearing it only once or twice allows them to set up a large number of lexical entries (albeit incomplete ones) in a relatively short time. Once they have some entry in memory, children can continue to add or adjust information that seems pertinent, over a lifetime if need be. During mapping the children must isolate the word forms of their language; they must create potential meanings; and then they have to map the meanings onto the forms.

However, as children map their initial meanings onto word forms, they must make certain decisions. Does word X pick out an object or an action, a state or a property, a relation in space, or an event with many participants? In making an initial decision, children presumably must attend to their existing ontological categories, and pick out whatever is salient - an entity or action, say - for which they do not yet have any label, as their initial target.

The promising response to the induction puzzle is to suggest that there is a range of different capacities as well as pragmatic directions underlying word learning (Macnamara, 1982; Kuczaj, 1982; Bloom 1997). Those capacities are the "linguistic capacities" (syntacting bootstrapping hypothesis, semantic bootstrapping hypothesis); and the "conceptual capacities" (thinking of the word as representing objects, properties, events and other entities). A discussion of both types of capacities, as well as alternative explanations, such as Nelson's interactive functional model for lexical acquisition and the role of pragmatic directions for word learning follows in the next subsections.

2.3.1 Linguistic capacities

How do children solve the mapping problem and work out what a phonological string refers to ? One of the explanations to the mapping problem assumes that children succeed in it by observing the contexts in which words are uttered. For instance, the sentence "is an elephant" is uttered when a large grey animal with a trunk is present, and so the child deduces that this is the referent. These explanations have been termed the "syntactic" and the "semantic bootstrapping" hypotheses.

2.3.1.1 Syntactic bootstrapping hypothesis

One clue to meaning is the syntactic context in which a word is used. The ability to use syntactic context to infer meaning is referred to as syntactic bootstrapping (Gleitman, 1990).Children use information about syntactic cues to hazard guesses about the denotation of words - syntactic bootstrapping- (Gleitman, 1990). Gleitman, emphasizes that word meaning acquisition does not take place in a vacuum, but instead occurs in a larger context, one context being the sentences in which children initially hear novel words (McShane, Whittaker & Dockrell, 1986; Bloom, 1994; Bloom & Kelemen, 1995; Lederer, Gleitman & Gleitman, 1995; Naigles & Hoff-Gingsberg, 1995).

Brown (1957) suggested that children might use the part-of-speech membership of a new word as a first cue to its meaning. To test this, he showed preschoolers a picture of a strange action done to a novel substance with a novel object. One group of children was told: "Do you know what it means to sib? In this picture you can see sibbing" (verb syntax); another group was told: "Do you know what a sib is ? In this picture you can see a sib" (count noun syntax); and the third group was told: "Have you seen any sib? In this picture you can see sib" (mass noun syntax). Then the children were shown three pictures, one that depicted the identical substance. They were asked to "show me another picture of sibbing" (or another picture of a sib, or another picture of sib). Brown (1957) found that the children were sensitive to the syntax when inferring the meaning of the new word; they tended to construe the verb as referring to the action, the count noun as referring to the object, and the mass noun as referring to the substance.

Brown's (1957) initial work on the count-mass contrast has been extended to younger children. Two - and three- year-olds will tend to construe a novel count noun as referring to a kind of individual (such as a bounded physical object) and a novel mass noun as referring to a kind of non-individuated entity (Bloom, 1994; Landau, Jones & Smith, 1988; Soja, 1992). More recently, children's sensitivity to syntax-semantic mappings has been explored in the area of verb learning (Gleitman, 1990) and extended to domains such as the acquisition of adjectives and prepositions (Bloom, 1996).

Given the complexity of word meaning acquisition, it seems likely that children use whatever information will help to narrow the available possibilities. The information provided by syntactic bootstrapping is important because it provide hints about the possible denotation of words, hints that may be especially important for words that lack concrete referents.

2.3.1.2 Semantic bootstrapping hypothesis

Semantic bootstrapping refers to the use of external contextual information about the semantic roles of entities that affect or are influenced by events to infer word meaning. For both oral and written language it is the context which gives words their meaning. In other words, words do not have fixed meanings, but rather take on different senses in different contexts.

Suppose the child observes a bear hitting a tiger in a distinctive way while the speaker says "the bear is kaboozling"; as noted above, the syntactic context would suggest an intransitive verb; however the salient activity would be an action whereby the bear influenced the tiger, and so could lead the child to infer that "Kaboozle" was a transitive verb. Had the same sentence been uttered in the context of a bear simply jumping around in an odd fashion, this would have supported the notion that "kaboozle" was an intransitive verb, and it would probably be interpreted as referring to that action (Bishop, 1998). Experimental support for the semantic bootstrapping comes from Au's (1990) study, who found that pre-school children can use information in the input very efficiently in learning a new word.

Semantic bootstrapping could be also related to the paradigmatic relations proposed by Kuczaj (Kuczaj, in press). Paradigmatic relations as defined by Kuczaj include lexical opposites, hyponymy and semantic sets. These sorts of relations provide one type of structure for the lexicon. Consequently, the manner in which children learn such relations has important implications for the development of the lexicon (Kuczaj, 1975, 1982; Carey, 1985; Clark, 1993).

Just as children may experience difficulty in determining the correct denotation of a word, they may have trouble ascertaining which semantic relation is the relevant one for words they are trying to relate. As children expand their lexicon, they learn more and more semantic domains. As a result, children are continually refining the nature and structure of their semantic sets and fields (Kuczaj, 1975; Dromi & Fishelzon, 1986; Dromi, 1987; Clark, 1993).

Children must discover a number of paradigmatic relations in order to correctly structure their lexicon. For example, children must learn that objects can be referred to by more than one word (Golinkoff and Bertrand, 1994).The children must also determine how the words relate to one another, and discover how they can be used to create metaphor (i.e. that boy is a dog (Winner, 1988). As the child discovers these sorts of relations, it is likely that word meaning development is launched. The child becomes better able to organize the lexicon (Kuczaj, 1982) and may also become aware of gaps in the lexicon (Clark, 1993).

2.3.1.3 Criticism of the linguistic capacities explanation

The process of selecting the correct referent using syntactic and semantic bootstrapping is facilitated in normally-developing children by their strong tendency to monitor the direction of gaze of other people, and hence to locate the focus of attention (Baron-Cohen, Baldwin & Crowson, 1993). This is a very effective strategy for learning some concrete nouns, but it is hard to see how other words, such as verbs, could be mastered this way (Fisher, Hall, Rakowitz & Gleitman, 1994).

2.3.2 Conceptual capacities

In the earlier discussion of the ability to differentiate words in the speech stream, three types of possible explanations were given. One possible explanation relied on the notion of constraints. The basic idea is that during the course of evolution, innately specified ways of interpreting and organizing information have come to determine the manner in which children acquire language. This type of explanation has become more popular in recent accounts of word meaning development. In this section, the theoretical underpinnings of the notion of constraints and the evidence for and against constraints of word meaning acquisition are discussed.

The task that children face in the construction of a lexicon is an arduous one. They must deal with an abundance of information, and somehow sort out individual words, their pronunciations, meanings, permissible combinations and communicative systems. Given the complexity of the task faced by children and the many possible interpretations when one is exposed to a new word, it has been suggested that children manage to acquire words and meanings as quickly as they do because their choices are constrained (Markman and Hutchinson, 1984).

There appears to be a rich array of such constraints regarding the acquisition of word meaning. Clark (1993) has suggested that those might ease the burden of the young child. Some of the constraints that have been identified and are discussed in the next section are the whole object constraint; the taxonomic constraint; the mutual exclusivity constraint; the principle of contrast; the contrast and conventionality; the basic level constraint (Mervis, 1987; Markman and Hutchinson, 1984; Markman 1991).

2.3.2.1 Constraints for word meaning acquisition

2.3.2.1.1 Whole object constraint

One proposed constraint is called the whole-object constraint which is that "a novel label is likely to refer to the whole object and not its parts, substance, or other properties" (Markman, 1990, p.59). From an early age children appear to expect that when they hear an unfamiliar label, they should find that it picks out some kind of object as a whole-and not just a part of it (Macnamara, 1982; Markman & Wachtel, 1988).

Nevertheless, some criticisms were raised. One of the criticisms came from Soja, Carey and Spelke (1991). They revealed that children have different strategies when applying words to solid objects and to non-solid substances. The paradigm employed was to present a solid shape such as "T" made out of piping, and frequently refer to it with a nonsense word. Then the 2-year-old children were asked whether the nonsense word referred to a similar shape made up of another solid substance or to parts of the original substance in different smaller shapes. As one might expect from the whole object assumption, 2 year olds applied the nonsense word to solid objects of the same shape as the original referent, rather than to the parts of the original.

More interesting findings occurred when the same procedure was used with a non-solid substance (e.g. cold ice-cream). In the test the children were given the same shape made up of different substance, or smaller elements of the original substance. They were asked to choose which set corresponded to the nonsense word. Children tended to choose the substance rather than the shape. Therefore, the study suggests that children, when learning words, have greater flexibility than the whole object assumption would suggest, and that at an early age they use their knowledge about the world to help them make appropriate choices when objects and substances are named. Another criticism identified by Nelson (1988) as the need to explain how children are able to acquire action and other types of words. Early vocabularies do not consist entirely of object words. How do children identify when it is inappropriate to employ the whole object assumption ?

2.3.2.1.2 Taxonomic constraint

Related to the whole object constraint is the taxonomic constraint, which is that "labels refer to objects of the same kind rather than to objects that are thematically related" (Markman, 1990, p.59). Thematically related entities include those that fall into "spatial, causal, temporal, or other relations" such as a dog and its bone, a dog and the tree that it is under, a dog and the person who is petting it, and so on. One important aspect of this proposal is that it is intended to be special to word learning. In a task that does not involve language, children are highly sensitive to thematic relations, for example, they will put a dog and a bone together when asked to sort objects into different piles (Markman, 1981). Markman's hypothesis is that this "taxonomic constraint" forces children to override this bias and attend to taxonomies (such as the kind DOG) when faced with the task of inferring the meaning of a new word.

Markman and Hutchinson (1984) present a set of studies that directly test this hypothesis. In one experiment, 2- and 3- year-olds were randomly assigned to one of two conditions. In the no word condition, they were shown a target picture (e.g., a dog) along with two other pictures, one of the same category (e.g. another dog) and one that was thematically related (e.g. a bone) and told: "See this ? Can you find another one?" In the novel word condition, children were shown the same pictures and told: " See this dax. Can you find another dax?" They found that children in the no word condition tended to choose the thematic associate, while children in the novel word condition tended to choose the object that belongs to the same category as the target. This suggests that the taxonomic assumption is special to word learning.

Nevertheless, the taxonomic assumption, has been widely criticised. Bavin, Ng, Brimmell and Gabriel (1993) have reported that 3 year olds who are acquiring Greek and Chinese do not behave in the same way as children learning English when given Markman's and Hutchinson's task. Also, Ralli and Dockrell (1995) showed that children's performance in the Markman's and Hutchinson's task changes when the context of presentation is modified.

In general, these constraints (taxonomic constraint and whole object constraint) are posited to explain the acquisition of words that refer to kinds of whole objects (e.g. dog), but the majority of lexical items acquired by children are not of this nature. Even 2- year olds possess words that refer to specific individuals (Fred), substances (water), parts (nose), properties (red), actions (give), and so on. This motivates further constraints that determine how words can relate to one another within the lexicon; these can lead children to override the whole object and taxonomic constraints.

2.3.2.3.1 Mutual exclusivity constraint

According to the mutual exclusivity constraint each object can have only one label (Markman & Wachtel, 1988). This assumption does not hold for adults, as pairs of words such as dog and pet or dog and Fido are not mutually exclusive. But it could be argued that children are biased to assume that words have mutually exclusive reference and only give up this assumption when there is clear evidence to the contrary. The fact that children appear to have some difficulty with class inclusion relations (where categories exist at different levels of abstraction, such as dog and animal) has been taken as evidence that children are reluctant to abandon this assumption (Markman, 1987).

Further evidence from Markman and Wachtel (1988) illustrates the role that this assumption can play in language development. When children are given a novel word describing a novel object, they will interpret the word as referring to that object (following the taxonomic and whole object constraints), but when given a novel word describing an object that they already have a name for, they will move to other, less favoured hypotheses, such as construing the novel word as a name for a part of the object or a name for the substance that the object is composed of. In a study by Gollinkoff, Hirsh-Pasek, Lavalle and Baduini (1985), children were shown two objects, one familiar and the other unfamiliar (e.g. a cup and a pair of tongs). When told: " Point to the fendle" they would tend to point to the unfamiliar object, suggesting that they assume that fendle could not mean "cup", a result predicted by mutual exclusivity.

Nelson (1988), in citing the work of others (Merriman, 1986; Mervis, 1984) has suggested that mutual exclusivity may be developmental in nature and may not be evidenced until the age of 3 years. Merriman's subjects were less than three years old. When given novel names for familiar objects with known labels along with unfamiliar objects they did not systematically apply the novel words to the novel objects. Mervis (1984) demonstrated that 1-year-olds simultaneously use basic terms (e.g., "kitty") and adult terms (e.g.,tiger) to apply to the same object and therefore are not yet using the principle of mutual exclusivity. Nelson (1988) suggests that because much of the work on mutual exclusivity has been performed with preschool children, it obscures the fact that this principle may develop in the course of language acquisition and may be not present in early word learning.

2.3.2.1.4 The principle of contrast

An alternative to mutual exclusivity is what Clark (1987) has called the principle of contrast. Following Bolinger (1977), she argues that there are no synonymous forms in natural language. In particular every word differs in meaning from every other word, though in some cases (e.g., couch and sofa, cup and mug) the difference is very fine. If children possess the principle of contrast, this could lead them to structure their lexicon so as to avoid interpreting new words as synonymous with existing forms. According to the principle, as words are acquired they will be differentiated or contrasted with existing words, and children will assume that different words have different meanings.

A classic study by Carey (1978) involved an experimenter asking 3- and 4-year-old children to "bring me the chromium tray, not the blue one" (the target tray was in fact olive green and there were only two trays available). Children, successfully picked out the tray with the unknown colour, and later on showed some knowledge of the meaning of the unknown colour term. This paradigm involves what has been termed a process of lexical contrast, whereby children work out the properties of an unknown word by contrasting it with another known word.

Dockrell and Campbell (1986) followed up this investigation and found that 3- and 4-year-old children were successful in acquiring a new name for an unknown toy animal in these conditions, but had more problems with acquiring colour terms. Further support for the principle of lexical contrast comes from Waxman and Hatch's (1992) study. In their study three- and four- year olds produced multiple hierarchically related labels for individual objects.

A useful clarification about the operation of this assumption has been made by Elbers, van Loon-Vernoom & van Helden-Lankhaar (1993) who put forward the principle of contrast usage. This suggests that when words are used contrastively children not only assume a difference between words (e.g in terms of which colour is referred to), but also assume that the words are referring to the same dimension (e.g colour). Consequently, Elbers, van Loon-Vervoom & van Helden-Lankhaar argue that the usefulness of contrast is in relation to other similar words rather than to the whole of the lexicon. They also suggest that such contrast will aid children's understanding of the relationship between words.

Thus, vocabulary acquisition grows naturally as the child is exposed to more and more words and picks out the contrasts in their referents. Clark (1987) notes: "the principle of contrast offers a powerful tool to children acquiring language. It constrains the inferences they can make about possible meanings for new forms by distinguishing them from already familiar forms" (p.28).

Contrast is clearly an important property of the language system and it has attracted a number of theorists (e.g. Barrett, 1978; Markman & Hutchinson, 1984). However, a number of criticisms have been opposed to the contrast principle. Nelson (1990) has pointed out that not all words are used contrastively. Also, the meaning of a word is complex and flexible. It shifts with use rather than having a fixed meaning. Furthermore, while constraints such as mutual exclusivity and the principle of contrast might explain why children sometimes abandon the taxonomic and whole object constraint, they do not explain how children actually acquire names for parts, substances, or abstract entities, let alone how they learn the meanings of verbs, prepositions, determiners and so forth.

2.3.2.1.5 Contrast and Conventionality

More recently, Clark (1991) has emphasised the operation of the constraint of conventionality as well as contrast. Conventionality is simply a pragmatic principle that words have conventional meanings within the language community. She supposes "that children appear to recognise very early that language is conventional, that the speakers around them have words for objects, events, states, and relations, and that a major task in acquisition is to map those conventional terms onto appropriate conceptual categories" (Clark, 1991, p.35).

What evidence is there that children observe conventionality ? First they target adult words from the start. They store in their memory word-forms based on what they hear from adults. As they are exposed to more of the input language, they must add to their repertoires of stored forms (plus tentative meanings) since they will rely on those in recognising words and processing further utterances from the speakers around them.

Second, children use such representations not only as targets for comprehension but also as targets for production. When they try to produce the words they have been hearing, they can use as guides any forms already stored in memory. The forms they store are unlikely at first to match adult targets exactly since young children at this stage are also working on the phonology of the language, and do not yet know which distinctions are systematic and which are not.

Contrast predicts that children will assume that differences in form mark, differences in meaning. From this and conventionality, it follows that in building up a vocabulary: (a) words contrast in meaning; (b) established words have priority; (c) unfamiliar (new) words fill lexical gaps; (d) innovative words fill lexical gaps. These predictions essentially parallel those made for adult language-use. The difference is that children start from a very small vocabulary and very limited knowledge of the world. Their knowledge about categories is necessarily limited by experience. Children have to find out which possible contrasts, in fact, hold in their language and, at first, they will not necessarily observe the same ones as adult speakers. They also have many more gaps in their vocabularies. They can fill these gaps with new words that they have heard used in contrast to familiar ones. They also fill them at times with innovative words coined just for the occasion.

2.3.2.1.6 Single level constraint or Basic level constraint

With the single level constraint, children act as if all the words they produce at first apply at only one level of specificity, as if there were only one level in the lexicon, with no superordinate or subordinate levels at which one could group objects lexically (Clark, 1993).

Anglin (1977) examined two- to six- year-old children's comprehension and production of labels at subordinate, basic and superordinate levels. He reported that although his subjects readily produced basic level terms, fewer than half were able to produce superordinate or subordinate level terms. Other researchers, focusing primarily on comprehension tasks have given further substance to this claim. Macnamara (1982) introduced preschool children to individual objects (e.g. a dog) and asked whether these objects could be labelled at both the basic level (e.g."Is this a dog?") and at the superordinate level (e.g."Is this an animal?"). Most children accepted the basic level terms, but most denied that the objects could also be described in superordinate level terms.

The data reviewed thus far, indicate that young children tend to accept one label (typically the basic level label) for objects and to reject other, non basic level labels. Yet, this single level assumption is certainly not inviolable (Gathercole, 1987). There are clearly some cases, even in the studies outlined above, in which children acknowledged that objects can be labelled at multiple levels. For example, Blewitt (1994) reported that children at a very early age do accept both basic and superordinate labels for objects in comprehension tasks.

Au and Glusman (1990) present similar data based on two-year-old children's comprehension of novel labels. Moreover, some investigators have suggested that children may be more willing to supplement their basic level labels with subordinate level labels than with superordinate level labels (Clark, Gelman & Lane, 1985). Also, Waxman and Hatch (1992) found that three- and four-year-old children were able to produce multiple, hierarchically related labels for a given object.

Mandler (1993) has questioned whether there is any rule which can reliably identify basic categories, and she argues instead, that basic categories are a result of social convention rather than conceptual analysis. Thus, an item is at a basic level if adults and children use that level to talk about referents.

2.3.2.2 Criticism of the Constraint theory

The constraints proposals discussed in the previous sections provide some possibilities about the acquisition of words. However, disagreement remains in relation to the importance of constraints for lexical acquisition, how best to characterize their nature and how do they originate (Behrend 1990; Nelson 1988). Moreover, Keil (1989) proposes that there are still strong disagreements about whether they are innate or acquired, domain specific or domain general.

Some scholars such as Nelson (1988, 1990) have argued that the constraint approach is fundamentally misleading. First of all, constraints have been criticised for failing to explain how children acquire names for parts, substances, or abstract entities, as well as the meanings of the verbs, prepositions, determiners and so on.

A second objection focuses on the claim that these constraints are present prior to word learning, perhaps as a part of a special acquisition device. Many investigators have suggested that children go through a stage (lasting 6 -12 months) where they use words in ways that violate proposed constraints. Barrett (1986) and Lucarriello & Nelson (1986) have observed one-year-olds to apply words only in highly restricted contexts; for instance, only using the word "car" when watching cars move on the street from a certain location. Children might also use words in "completive" ways; for example, a child might use the word "clock" to refer to clocks, to dials and timers, to bracelets, to objects that make buzzing noises, and so on, suggesting that the word refers not to a kind of object, but to "an associative complex of features" (Rescorla, 1980). Only when these usages largely disappear does the naming explosion begin.

Nelson (1988) suggests that this is the point when the child seems to have accomplished the understanding that words name categories of objects and events, which implies that the constraints are the result of early lexical development. If this were true, then they clearly cannot serve as an explanation for how children acquire their first words.

Finally, Nelson claims that the results found by Markman and other researchers suggest more of a bias than a constraint. For example, children's performance on the type of forced-choice task used by Markman and Hutchinson (1984) has traditionally been described as preference for thematic relations over categorical ones. Although Markman and Hutchinson also speak of children's conceptual preferences for thematic relations, they formulate children's taxonomic choices in terms of constraints. Rather than suggesting that when pictures are labelled, children's preferences or biases switch from thematic to taxonomic choices or that children employ different strategies under the two task conditions, they claim that labels constrain their choices.

The connotation is quite different: Constraints imply restriction; whereas preference implies free, but biased choice. Gathercole (1987, 1989) suggests that children possess more of a bias than an absolute constraint, which once again is said to undermine the notion that the constraints are genetically hard wired and exist prior to word learning.

Not only does the theory need to be developed, but the methods need further refinement. Experimental studies can be criticised for providing an artificial situation for word learning. However, there are also problems with data which are based on diary recordings of children's speech because of the uncertainties about the meaning of children's first utterances.

At best, the proposed constraints might be biases or strategies that children use when trying to sort out the plethora of information available to them, along the lines of the strategies initially suggested (Kuczaj, 1982, Dockrell & Campbell, 1986). If children do exhibit biases in their acquisition of word meaning, the biases are not absolute, but instead reflect information processing strategies that children might use (rather than must use), such as depending on individual differences and context (Kuczaj, 1982).

2.3.2.3 Alternative explanations to the constraints proposal - Towards an interactive functional model

Invoking constraints does not go beyond a description of data. A logical move to get beyond the demonstration of biases is to investigate their origin, that is to determine whether they operate from the beginning of word learning or are the product of that process.

Nelson (1990) proposes that the process of lexical acquisition generally involves:
(a) *a child interacting with the world of people and things and attempting to make sense of it, forming representations of events and concepts of objects*;

(b) *parents, siblings, and other adults interacting with the child linguistically and nonlinguistically in a variety of contexts, including play and caretaking, focusing on the child or on other people's activities*;

(c) *within these varied contexts, words being used that have conventional meanings in the parent language, children being introduced to them in situations where their use is appropriate and their reference often thereby transparent.*

The conditions of lexical acquisition sketched out above not only differ from the constraints' theorists approach, but contrast markedly with the choice and sorting tasks typically employed in this research. In these experiments there is no real-world interactive context, no adult collaborator to support inferences and provide feedback. The child is forced to rely on his or her own strategies of interpretation. What the child interprets are the experimenter's implicit demands as reflected in the task and instructions and, as has been demonstrated, different conditions lead to different interpretations. The relevance of evidence coming from experiments drawing on theories such as the constraints approach to word learning under natural conditions are seriously in doubt.

Nelson (1988) contrasted the notion of "constraint" with that of "bias". For Nelson a constraint implies some sort of restriction that should result in uniform development patterns. In contrast, a bias implies some sort of preference rather than an absolute predisposition. Nelson's own position is that constraints on word meaning do not exist. She rejects the sort of hypothesis formation and testing model, arguing that "children, like adults, do not seek certainty of reference, but only communicability". She adopts a Wittgensteinian (1953) alternative that conceptualizes understanding of language as the capacity to participate in a language game. As such the development of language is better viewed as a social convergence process, where the adult and child work together to attain communicative success (Adams & Bullock, 1986; Nelson, 1985, Vygotsky, 1962).

That model is based on what she calls "experientialism" (1996). According to Nelson experientialism is not equivalent to the traditional empiricist assumption that all knowledge is built up from sensation. Experience based knowledge derives from varying sources: from action in the world, from perception, from biological dispositions to organise patterns of experience in specific ways, from social interactions and activities, and from cultural arrangements. Experientialism assumes that dynamic processes are in continual interaction with the experienced world, yielding ever-changing models of reality.

The continuing problem for the child is to acquire word forms and match them to the contexts of word uses of the adult. Even when the child uses a form in the same contexts that the adult does, it may be that the two do not have the same meanings, as Vygotsky (1962) stressed. The child is guided toward the conventional uses by the adult, both directly and indirectly. But the child must also rely on his or her own cognitive processes to construct meanings from the language in use. According to Adams and Bullock, (1986) there are two necessary conditions to the establishment of a working lexicon: (a) cognitive processes, including especially the establishment of conceptual representations and the formation of relations among concepts of varying kinds; and (b) the guidance direct and indirect, of the adult partner toward convergence on conventional meanings, including both denotation and sense (Dockrell & Campbell 1986; Lyons, 1977; Nelson, 1985).

Nelson supports her perspective by citing several studies suggesting that mothers tailor their naming practices to the age and capacities of the child (Mervis, 1984). Several studies have also provided evidence that constructing a semantic system is a collaborative project. For example, a number of studies have traced the effects of maternal naming practices on children's lexical development. Ninio and Bruner (1978) examined the evolution of mothers' picture-book reading practices as children's competence at naming increased over the course of several months. Mervis's (1984) work showed that mothers adapt their use of object labels for their 1-year old children to what they believe the child's category to be, but also provide distinctive information as the child grows older to enable the child to find the conceptual basis for the conventional adult label for an object.

Barrett et. al. (1986) reported that during the very earliest period when children tend to restrict their word uses to a single object or situation, their mothers were found to be restricting their own uses in a similar way, suggesting that the child's uses were scaffolded by the adult model or vice verca. Lucariello and Nelson (1986) found that maternal naming practices varied by context and provided clues within those contexts that the child could use for constructing hierarchical categories from event knowledge. Watson (1987) found that mothers' uses of superordinate terms for 2 and ½ year-old children were significantly correlated with children's understanding of such items one year later.

Together, these accumulating evidence provide important support for the proposal that word learning and lexical development in general are functions not only of a child's developing capacities and dispositions but of the contextually and developmentally dependent guidance provided by parents and others.

What, then, supports lexical development? To recapitulate, first the child's own developing capacity for, and interest in, categorizing objects and events in the world. Second, learning is supported by adults who label those objects and events in different contexts and at different developmental points and the kind of information they supply to the child about them. Finally, the semantic-conceptual system itself determines the course of development. At first, the child does not even know how words can be used, thus acquisition of words is restricted to certain contexts. Later, when words are mapped to the conceptual system, they are limited to denotational aspects derived from the child's experience. Finally, the lexicon may expand indefinitely as words are related to other words and knowledge is gained through language as well as through direct experience.

However, a constraint theorist might argue that regardless of how some mothers might aid children in the process of word learning, children are still faced with a logical infinity of candidate hypothesis. Psychologists have to develop a theory of the sorts of mental mechanisms that allow children to infer the correct hypothesis from the linguistic and non linguistic context that they are exposed to or they have to use the theory of constraints.

Nonetheless, the existence of such approaches suggests that there may be worthwhile alternatives to the straightforward "hypothesis testing" theory of the acquisition and representation of word meaning. Probably an integration approach between constraints-or preferably strategies- and complex interactive functional model would offer a better option to the lexical acquisition problem. The environmental conditions where the children can learn any words needs to be explained in more depth.

2.3.3 Pragmatic directions and lexical acquisition

When speakers plan an utterance, they choose a specific perspective on what they wish to speak about. This perspective, marked by word choice, allows them to present to their addressees a specific conceptualization of an object, property, relation, or event. Word choices allow speakers to conceptualize the same entities and events in different ways. They therefore allow speakers to highlight properties pertinent to the goal of the discourse. As Lakoff and Johnson (1980) put it " In making a statement, we make a choice of categories because we have some reasons for focusing on certain properties and downplaying others (p. 163)". Depending on one's conversational goal, one might refer to a neighbour variously as the cellist, the mother of three, my cousin, or the Mayor.

The notion of conceptual perspective is important in lexical acquisition because of two radically different proposals. One is that children can take different perspectives on the same object or event, and so accept and produce multiple terms for the same referent, from as soon as they have the necessary words. This is the *many perspectives view*. The other is that children at first take only one perspective on each object or event because this simplifies their word learning in the early stages. As a result they can accept and produce just one word for a referent type. This is the *one perspective view*.

To establish a perspective, speakers and addresses rely on a host of pragmatic directions every time they converse. Pragmatic directions offer guidance to how an addressee should treat the speaker's utterances. They depend on non-linguistic information about the speaker's locus of attention.

Specifically pragmatic directions to a child addressee may serve to indicate what meaning to assign to unfamiliar words, for instance, through ostensive statements like "*That's a wallaby*"; and how to relate the meaning of familiar and unfamiliar terms. In spelling out the nature of such connections, pragmatic directions offer specific information about such relations as inclusion, parts, properties, and functions. Pragmatic directions are relevant to all facets of language use, the mutual knowledge speakers and addressees have about each other and about the current conversation, the words and constructions chosen, the manner of delivery, direction of gaze, gestures, the physical setting of the conversation, and so on (Clark, 1996; Clark & Carlson, 1981; Levinson, 1983).

Clark & Grossman (1998) claim that children readily adopt alternate conceptual perspectives on the same entity. They both accept and make use of multiple terms for referring to the same entities, and they do so from as early as 18 months. The emergence of perspective-taking marked by lexical choices appears to coincide with the emergence of spatial perspective-taking and with the onset of pretend play, both of which presuppose the ability to take alternate perspectives on the same entity.

Regarding alternate perspectives, children need to understand how terms are related. For example, nothing in the forms of the words animal and cat would allow the inference that a cat could be referred to as either the cat or the animal. But if children are offered pragmatic directions like " A cat is a kind of animal" or "That cat is Jan's pet", they readily adopt the alternate perspectives required. If such directions are absent, they may ignore a new term or refuse to use it. They lack the information needed to infer that it too refers to the target object type. In word learning tasks, it is the presence or absence of the relevant pragmatic directions that accounts for whether children will or will not accept more than one term for a particular object.

Taken together the importance of Nelson's (1990) interactive functional model and the importance of pragmatic directions as proposed by Clark (1998) a theory of word learning from context proposed by Sternberg and Powell (1983) is discussed in the next section.

2.4 Towards a theory of word learning from context

Sternberg and Powell (1983) have developed a theory of word learning from context. They argue that learning from context provides a way of integrating two aspects of verbal ability (vocabulary and comprehension). The theory distinguishes between those aspects of vocabulary acquisition that lie strictly outside of the individual, that is, contextual cues present in the verbal context itself that convey various types of information about the word, and those aspects of vocabulary acquisition that lie at least partially within the individual, that is, mediating variables that affect the perceived usefulness of the contextual cues.

The contextual cues determine the quality of a definition that can theoretically be inferred for a word from a given context. The mediating variables specify those constraints imposed by the relationship between the previously unknown word and the context in which that word occurs that affect how well a given set of cues will actually be utilized in a particular task and situation. In the next sections, the application of each of these aspects of context utilization will be discussed.

2.4.1 Decoding of External Context

When someone encounters new words in a verbal or written context, he/she may attempt to utilize the external context in which the words occur in order to figure out their meanings. Sternberg & Powell's (1983) theory specifies external contextual cues and the mediating variables that influence the likelihood that these meanings will be correctly inferred.

Contextual Cues

Context cues are hints contained in a passage that facilitate decoding the meaning of an unknown word. Sternberg and Powell (1983) propose that contextual cues can be classified into eight categories depending on the kind of information they provide. These context cues are the following:

(a) temporal cues: cues regarding the duration or frequency of X (the unknown word) or regarding when X can occur;

(b) spatial cues: cues regarding the general or specific location of X or possible locations in which X can sometimes be found;

(c) value cues: cues regarding the worth or desirability of X or regarding the kinds of affect X arouses;

(d) stative descriptive cues: cues regarding physical properties of X (such as size, shape colour, odour, feel etc);

(e) functional descriptive cues: cues regarding possible purposes of X, actions X can perform, or potential uses of X;

(f) causal/enablement cues: cues regarding possible causes of or enabling conditions of X;

(g) class membership cues: cues regarding one or more classes to which X belongs or other members of one or more classes of which X is a member;

(h) equivalence cues: cues regarding the meaning of X or contrasts (such as antonym) to the meaning of the X.

Although the cues are at present listed in terms of the sorts of information that a given context can provide about X (the unknown word), each of these cues can alternatively be used to refer to the sort of information that X (the unknown word) provides about Y (another word or concept in the passage).

In order to concretize the previous descriptive framework, Sternberg and Powell (1983) use the following example. Consider the sentence: "At dawn the "blen" arose on the horizon and shone brightly". This sentence contains several contextual cues that could facilitate one's inferring that blen probably means sun. "At dawn" provides a temporal cue, describing when the arising of the blen occurred; "arose" provides a functional descriptive cue, describing an action that a "blen" could perform; "on the horizon" provides a spatial cue, describing where the arising of the blen took place; "shone" provides another functional descriptive cue describing a second action a "blen" could do; finally "brightly" provides a stative descriptive cue, describing a property (brightness) of the shinning of the "blen". With all these different cues, it is no wonder that most people would find it very easy to figure out that the neologism "blen" is a synonym for the familiar word sun.

However, no claim can be made that these categories are mutually exclusive, or independent in their functioning. On the other hand, it cannot be argued that they represent a true categorisation of context cues. Nevertheless, this classification scheme has been found to be useful in understanding strategies in deriving meanings of words from context. It should also to be noted that not every type of cue will be present in every context, and even when a given cue is present, the theory proposes that the usefulness of the cue will be mediated by the sorts of variables to be described in the next section.

Mediating variables

Whereas the contextual cues can specify the particular kinds of information that might be available for an individual to use to figure out the meaning of unfamiliar words, the mediating variables specify those variables that can affect, either positively or negatively, the application of contextual cues present in a given situation. The mediating variables for external context include:

(a) The number of occurrences of an unknown word;

(b) The variability of the contexts in which multiple occurrences of the unknown word appears;

(c) The density of the unknown words.

(d) The importance of the unknown word to understanding the context in which it is embedded;

(e) The perceived helpfulness of surrounding text in understanding the meaning of the unknown word;

(f) The concreteness of the unknown word and the surrounding context;

(g) the usefulness of prior knowledge to cue utilization.

Multiple occurrences of an unfamiliar word, particularly in variable contexts increase the number and kinds of meaning cues available to the child. They can also heighten awareness of the word and stimulate an attempt to actively recall and integrate information from previous contexts. Furthermore, different types of contexts are likely to supply different types of information about the unknown word.

According to Sternberg and Powell (1983) variability of contexts increases the probability that someone will get a full picture of the meaning of a given word. In contrast, mere repetition of a given unknown word in essentially the same context as that in which it previously appeared is unlikely to be as helpful as a variable context repetition. That probably happens because few, or no really new cues are provided regarding the word's meaning.

Variability can also present a problem in some situations and for some individuals. If the information is presented in a way that makes it difficult to integrate across appearances of the word or if a given individual has difficulties in making such integrations, then the variable repetitions may actually confuse rather than clarify the word's meaning. In some situations and for some individuals, variable contexts may cause a stimulus overload to occur, resulting in reduced rather than increased understanding. For example, Werner and Kaplan (1952), investigated to what extent children (aged 8;6-13;6) could grasp the meaning of an artificial word appearing in different sentences which progressively provided additional information about the nonsense word. They found that the younger children could not complete the task (provision of a definition) successfully.

The density of unknown words in a passage may also affect cue utilization. In passages containing a relatively high number of unfamiliar words, context provides less information about the meaning of any single word, because the context for unknown word x may contain words y and z unknown as well. Moreover, a high density of unknown words tends to increase passage difficulty, which in turn may function to discourage the child from devoting much time and energy to the passage.

Furthermore, the child's perception of the importance of the unknown word to understanding the sentence or passage should influence whether the child allocates resources to figuring out the word's meaning. The child may perceive as unimportant an unfamiliar word that occurs in the description of a setting (e.g. scudding clouds), and unless the child is curious about the word, s/he is unlikely to expend effort in deriving it's meaning. On the other hand, when a word is judged as central to the context, then context cues may be searched out.

When present, the proximity of relevant contextual cues to the unknown word may be important. Proximity should raise their salience and increase the likelihood that the child will recognize them as information that is relevant to the unknown word. The meaning of some words is more difficult to grasp than the meaning of others. For example, words that have concrete referents are in general easier to comprehend than ones with abstract referents. Last, individual differences in prior knowledge about the cued information may determine how and whether different people take advantage of the available cues.

Experimental evidence: Learning from External Context

To test the explanatory power of this theory, Sternberg and Powell (1983) gave high school students brief passages, written in various literacy styles (e.g. literary, newspaper, science, historical), containing one or more unfamiliar words. The students' task was to define, as best they could, each of the low-frequency words within each passage. The independent variables were ratings of the number and quality of context cues along with the mediating factors delineated in the model. Together these factors accounted for between 72% and 92% of the variance in deriving definitions from context, depending upon the particular literacy style of the passage.

Furthermore, studies by Carnine, Kameenui, & Coyle (1984) Beck, Mckeown & McCaslin (1983) examined deliberate learning from context through the use of tasks that explicitly asked readers to derive the meaning of an underlined word appearing in a text passage. Carnine et. al. (1984) used experimental passages designed to present clues to specific words and control for distance between the clue and the target word. They found that fourth- and sixth-grade children were better able to identify meanings of words presented in context than of words presented in isolation. However, even the best performance, that of sixth graders, showed a success rate of only 40 percent, with type and distance of clue making a difference. Synonym clues provided better results than clues requiring an inference. Furthermore, clues closer to the target word were more helpful than those far away. Clues that both required inferences and were distant from the target word yielded correct outcomes only 17 percent of the time.

Beck et. al. (1983) used natural text to test their hypothesis of a continuum of effectiveness of natural contexts for deriving word meaning. They identified four points along the continuum: misdirective contexts, which seem to direct a reader toward an incorrect meaning; nondirective contexts, which offer no direction for word meaning; general directive contexts which offer correct but general clues; and directive contexts which seem to lead to a correct meaning for a word. The researchers presented adults with stories from fourth- and sixth-grade basal readers in which target words were blacked out and asked them to supply the word or a synonym. The results varied greatly by context type. Correct responses were given for 3 percent of the misdirective contexts, 27 percent of the nondirective contexts, 49 percent of the general contexts, and 86 percent of the directive contexts. Hence, Beck et. al.(1983) concluded that not all contexts are created equal.

The question of whether readers learn words incidentally from context through normal reading was examined in studies by Jenkins, Stein, & Wysoski (1984) and by Nagy & Herman and their colleagues (Herman, Anderson, Pearson & Nagy, 1987; Nagy, Anderson & Herman, 1987; Nagy, Herman and Anderson, 1985). The tasks used in these situations reflected a more natural reading situation in that readers were not told that the purpose was related to word learning, and the target words were not identified.

Jenkins, Stein, and Wysoski (1984) had children read unfamiliar words under relatively natural reading conditions (emphasis was not placed on vocabulary learning). The main independent variable was the number of encounters students had with the unfamiliar word. Brief passages were constructed, each containing a target word whose meaning was not likely to be known by elementary aged students (e.g., altercation, incarcerate). Each passage also contained a synonym for, or words which strongly cued the meaning of the target word. Eighteen low-frequency target words were divided into three sets of six, which were counterbalanced across conditions. Ten such passages were constructed for each word. Under the different exposure conditions, students read either two, six, or ten passages for each of the six target words. Students in the 10-exposure condition read six passages (one for each target word) per day over 10 days. Students in the six-exposure condition read six passages spread over 10 days, while those in the two-exposure condition read six passages on days 1 and 10. Thus, the distribution of passages for the three-exposure conditions controlled for recency effects prior to post-testing.

Various vocabulary measures were created. Two were definitional tests, one requiring students to choose a correct definition or synonym from several alternatives, the other requiring students to apply a suitable synonym or definition for a target word which appeared in a sentence with minimal context clues. Two other measures involved word usage. One was a sentence anomaly test which required students to state whether a sentence made sense. One sensible sentence and one nonsense sentence were created for each word. The other usage measure was a sentence completion test. For each target word a sentence stem was created which included the target word followed by four choices, only one of which was correct. In addition, to obtain zero-exposure, in the control group students were also tested on non-exposed words.

They found that children can acquire word meanings from context. For this to happen, however, the words must be encountered several times, even when each encounter is accompanied by strong context clues. Ability differences again appeared, with higher-ability readers learning more word meanings than lower-ability students.

Moreover, Nagy et. al. (1987) assumed that the evidence of learning from context was not captured by most studies, because such learning proceeds in small increments that the measures used in many studies have failed to capture. To examine this assumption they employed a variety of measures designed to capture partial knowledge. The researchers had seventh and eighth graders read passages containing target words and then respond to three levels of multiple choice tests. The easiest level required only that the reader have some very general knowledge of a word (knowledge of its part of speech or its general category) which were sufficient to get the item correct. An interview task was also used in which readers were asked to give definitional information. The study yielded small but robust effects for learning from context.

Nagy et. al. (1987) point to the issue of measurement sensitivity in discussing their finding of effects of single contextual exposures in contrast to Jenkins et al.'s (1984) conclusion that at least more than two exposures were needed. Only the most difficult level of Nagy et al.'s range of multiple choice items was comparable to the difficulty level of the multiple choice test used by Jenkins et. al. Furthermore, although both groups of researchers asked students to produce definitions, the scoring criteria were much more moderate for Nagy et. al.'s interview responses.

In later studies, Nagy and Herman considered other text and reader characteristics that could affect learning from context. Herman et. al. (1987) found that learning from context was facilitated by conceptually explicit text and higher reading ability. Nagy et. al. (1987) found that the conceptual difficulty of a word or of the text, diminished the learning of the word. But they failed to find an effect for reading ability, which is a departure from findings about the relationship between reading ability and learning from context reached by many previous studies.

Dickinson (1984) studied the effect of varying the exposure context of a new word. Using children aged 4 and 11 years, he presented them with one novel word in either a conversational context, a story context or an explicit definition. The effect of presentation mode varied with age: 11-year-olds were better at word recognition from the definitional context than from the story context, whereas the 4-year-olds learnt little from either context. The older children were excellent on usage of the words they had heard in stories, therefore they must have formed representations of these words. Some learning was taking place from hearing a single presentation of a novel word, in all three contexts.

Coyle (1984) compared words in context to words in isolation. Children aged 8 and 10 years were asked first to choose the correct meaning (from four alternatives) of unfamiliar words in isolation. The words were then presented in passages constructed to provide contextual cues. The children were told to read the passages, either with a neutral instruction, or an instruction alerting them to contextual information. The word meanings had to be chosen again from four possibilities. Scores on the words-in-context were significantly higher than on the words-in isolation test, but there was no effect of calling attention to the contextual cues by instruction. Children use context to infer meaning of novel words without being directly instructed to do so.

The studies discussed so far indicate that some learning from context does occur. However, a most interesting facet of the literature in this area is that the power of contextual effects is interpreted in markedly different ways by different researchers. Nagy et. al. (1985) characterize the effect as substantial and hypothesize that the overall influence of context on vocabulary learning is large because the volume of reading students typically do, allows for a great accumulation of encounters with unknown words, and ultimately, learning of a substantial numbers of words. On the other hand, Jenkins, Stein and Wysoski (1984) conclude that learning from context does not come easily or in large quantities.

2.4.2 Decoding of Internal Context

By internal context, Sternberg and Powell (1983) refer to the morphemes within a word. Multiple morphemes such as prefixes, suffixes, and stems, give the word meaning. Again, the theory proposes a set of contextual cues and a set of mediating variables that together determine the quality of a definition that can be inferred from a word's internal context.

Contextual Cues

Four types of contextual cues have been identified: Prefix cues; Stem cues; Suffix cues; Interactive cues. Interactive cues are formed when two or even three of the word parts listed above convey information in combination that is not conveyed by a given cue considered in isolation from the rest of the word. The usefulness of these kinds of cues in decoding meaning can be shown by the following example used by Sternberg and Powell (1983).

Suppose one's task is to infer the meaning of the word "thermoluminescence". The word is probably unfamiliar to most people. But many people know that the prefix "thermo-" refers to heat, that the root "luminescence" is a verb meaning to give off light, and that the suffix "-ence" is often used to form abstract nouns. Moreover, a reasonable interpretation of a possible relation between "thermo-" and "luminescence" would draw on one's knowledge that heat typically results in some degree of light. Note that this cue derives from an interaction between the prefix and the stem. Neither element in itself would suggest that the light emitted from heat would be a relevant property for inferring word meaning. These cues might be combined to infer that "thermoluminescence" refers to a property of light emission from heated objects. This inference would be correct. These internal contextual cues represent one possible classification scheme. The extent to which these cues are utilized, if present, depends on the mediating variables described in the next section.

Mediating Variables

The mediating variables specify relations between a previously unknown word and the external context in which it occurs, that mediate the usefulness of internal contextual cues. The model includes five variables that affect internal cue usefulness, usually by influencing the effort to be expended on deciphering the word in general, and on utilizing the internal context in particular. The mediating variables are the same as the ones previously referred in the section decoding from external context (see p. 42).

To summarize, Sternberg and Powell's theory of word learning from internal context specifies kinds of internal cues that individuals can use in inferring meanings of previously unknown words and also specifies variables that affect how well these cues can be utilized in actual attempted applications. The contextual cues refer to the types of information that might be present within the word; however, these cues are not sufficient for describing actual context utilization. Thus, the theory also includes a set of mediating variables that determine the differential application of the set of internal contextual cues, both across texts for a single individual and within a single text across individuals.

Experimental Evidence: Learning from "Internal Context"

Some experimental work has been carried out in order to address the question of whether individuals use "internal context" in figuring out word meanings (Kaye & Sternberg, 1984). Kaye and Sternberg (1984) tested a total of 108 secondary school and college students. Each subject was exposed to 85 very low frequency prefixed words that were selected each to contain 1 of 15 commonly used Latin stems. Each word was paired with four possible definitions, one of which was correct and three of which were incorrect. One of the incorrect definitions retained the meaning of the prefix only, one retained the meaning of the stem only and one retained the meaning of neither the prefix nor the stem. An example of an item in the word-definitions task was the following: "exsect" means (a) to cut out (totally correct); (b) to throw out (prefix only correct); (c) to cut against (stem only correct); (d) to throw against (totally incorrect).

The results suggested that college students, but not high school students, were able to use "internal context" to help infer word meanings. The pattern of results suggested that the word stem was the central focus for determining what each of the various words meant, with the prefix modifying this stem meaning.

More recently, Shu, Anderson and Zhang (1995) examined the role both of the "internal" and "external" context in acquiring word meanings. In a study involving American and Chinese children in third and fifth grades, they investigated children's natural learning of word meanings while reading. The children read one of two cross translated stories and then completed a test on the difficult words in both the story they read and the one they did not read. A checklist test was used to examine children's knowledge of target words before reading. Multiple choice tests were constructed to measure children's word knowledge after reading.

The results showed significant incidental learning of word meanings, in both grades and both countries. In each country, incidental word learning appeared on both easy and difficult test questions and among children of all levels of ability. For children from both cultures, the strength of contextual support in the stories and the conceptual difficulty of words affected learning. The morphological transparency of words influenced word learning among Chinese fifth graders but not American children in either grade showing the effects of the "internal context" as well as that they can vary across languages.

What can be concluded, overall, from the previous studies, is that a theory of learning word meanings from "internal context" is an important part of a full theory of verbal comprehension, and that such a theory can pave the way both for a fuller understanding of the nature of verbal comprehension and for a means by which to train individuals to improve their comprehension.

In sum, this chapter focused on a theory of word learning from context. This is a very important theory for the acquisition of word meanings, since words usually appear in different contexts and not in isolation. The identification of the "internal" and "external" contexts is also important for the formation of a theory on how children learn new words from context.

However, other factors need to be taken into account such as the cognitive abilities of the child (phonological memory, vocabulary knowledge etc.). Furthermore, the experimental evidence supporting the theory of word learning from context are drawn from the area of reading. It would also be important to test the same theory through other means of presentation, for example, when children are not yet able to read, but they listen to stories, and see what other mechanisms are involved.

Chapter 3:

FAST MAPPING: EXPERIMENTAL EVIDENCE

3.1 Introduction

The present chapter introduces different sources of word learning identified by various researchers and includes evidence for the role of input for word learning. Particularly, two types of evidence are discussed. Evidence from traditional fast mapping studies and evidence from more naturalistic situations such as a story reading. The role of child-based factors such as phonological memory and existing vocabulary knowledge raised by previous studies is also discussed. The chapter concludes with issues on assessing vocabulary knowledge, discussing various methods that have been used in the past to assess word learning.

3.2 Sources of word learning

Two types of sources of vocabulary learning can be identified: (1) the incidental and (2) the intentional learning situations (Jenkins, Stein, & Wysoski, 1984; Nagy; Herman and Anderson, 1985). In an incidental learning situation, the major purpose for the interaction with the particular environment is not to learn words. Sources of incidental learning include oral environments such as conversations, films, television, listening to stories, and written environments, from signs and letters to magazines and books. Intentional sources for learning vocabulary are ones in which the explicit purpose of an interaction is to learn the meaning of a word. These include a learner's decision to consult a source, such as a dictionary or a more knowledgable person, and direct instruction on the meanings of the specific words.

Most of the fast mapping studies - focusing on the role of input for word learning - can be categorised into two groups: those in which the context of presentation of the new word was an artificial one and those that used a more natural context of presentation like a story reading. Examples of both types of studies are presented in the next subsections.

3.2.1 Evidence from Traditional Fast Mapping Studies

The study cited most frequently as representing the fast mapping paradigm is that of Carey and Bartlett (1978), in which the new word "chromium" was introduced to 3- and 4- year - old preschool children in a naturalistic setting. The teacher, when setting up for a snack, individually asked each child: "See those two trays? Bring me the chromium one, not the red one, the chromium one". The use of an explicit contrast, "red" versus "chromium" indicated "chromium" as a colour word and was intended to allow the child to identify readily the referent (the olive-coloured tray).

With comprehension and production tasks administered one week later, Carey and Bartlett (1978) found that one to two encounters with the word had allowed at least half of the children to map something about the word in long-term memory. As noted by Carey and Bartlett (1978) the children's partial mappings of "chromium" were quite variable and highly dependent on the child's preexisting colour lexicon and the name the child used for "olive" during pretests.

Other studies have examined word learning of known concepts in young children with particular interest in which words would be learned faster, words for objects with existing labels or words for objects with unknown labels. One such study is that of Dockrell (1981) in which children had to identify the referent in a picture when an unknown word was used. When children had already a name for an object, they had more difficulty indicating that object as the new word. As suggested by Dockrell and Campbell (1981), the children used a preemption "strategy" and preempted use of the novel word with the known word. That would be an example of the principle of contrast (Clark,1987).

In later work, however, Dockrell and Campbell (1986) compared the introduction of new words and objects using perceptual and lexical contrasts (e.g., "Pass me the *gombe* block, not the red or green one"). In this study, preemption did not preclude the children learning a synonym for known terms. Thus, Dockrell and Campbell (1986) suggested that preemption may be a significant variable only at particular stages and in particular circumstances.

Banigan and Mervis (1988) investigated the relative effect of four input strategies in inducing the 2-year-old children to learn the adult-appropriate label and begin to form a new category. Seven object pairs were used (e.g. horn-funnel or horse-unicorn). The four input strategies were presented in four conditions. In all conditions the input was presented twice, during which the child was told the label for an object a total of four times. The conditions differed in the information provided in addition to the object name. In the label only condition, no additional information was provided. In the label/description condition, the child was given a verbal description of the object which included the critical form-function correlation that made the object a member of the adult's-basic category. In the label/demonstration condition, the child was given a demonstration of the same form-function correlation as was described in the label/description condition. In the label/demonstration/description condition, the same form-function correlation as in the two previous conditions was demonstrated while the experimenter described it verbally. Comprehension and production tests were then administered.

It was found that the most effective strategy involved labelling an object and providing both a physical demonstration and a verbal description of important attributes that made the object a member of the adult appropriate category. Neither the label plus verbal description strategy nor the label only strategy was effective for children of this age.

More recently, Au (1990) investigated how children use the information given in a certain context in order to acquire the meanings of new words. The first study investigated how

4-year-old children's preferences for certain hypotheses might affect their use of contrastive linguistic information in the input to learn new words in two domains: material and shape. There were three conditions: label only, material name contrast, shape name contrast.

In the label only condition, the experimenter would point at a swatch a few feet away and asked the child: "Can you bring me the rattan (or trapezoid) thing ?" When the child handed her the swatch, she said: "See, it's rattan (or trapezoid)". In the Material Name Contrast Condition, the child heard: "Can you bring me the rattan thing ? And then "See, it's not paper, and it's not cloth. It's rattan". Each child heard a novel name contrasted with two familiar material names. In the shape name contrast condition, the child heard: "Can you bring me the trapezoid thing? And then "See, it's not round, and it's not triangular. It's trapezoid". Each child heard a novel shape contrasted with two familiar shape names.

Five tests were designed to find out what the children thought the new word was (sorting task, co-hyponym task, colour identification task, material identification task, shape identification task). This study revealed that children favoured shape over material in their hypotheses. Children made use of linguistic contrast only in some situations. Three- and four-year-olds benefited from pertinent linguistic contrast in learning novel material names. They did not reliably benefit from pertinent linguistic contrast in learning novel names for some shapes. In Study 2, another group of 3- and 4-year-olds were asked to name the materials and shapes used for introducing these novel terms. It was found that they benefited more when the novel term did not overlap much in denotation with any terms commonly known by 3-and 4-year-olds. These results suggest that children can use information in the input very efficiently in learning a term for an as-yet-unnamed category, but not in learning a term similar in denotation to a word they already know.

Gottfried and Tonks (1996) investigated how differential input affects preschoolers' abilities to learn novel colour terms. Three- four- and five- year old children saw objects in novel shapes and colours and heard a novel colour label for the object. Labels were presented through ostensive definition (e.g., "See it's mauve") corrective linguistic contrast (e.g., "See, it's not purple; it's mauve") or an inclusion statement (e.g., "See it's mauve; it's a kind of purple"). The children were tested on their interpretation of the novel word immediately following its introduction. The measurements used were a generalization task, co-hyponym task, colour identification task and relations task.

Four- and five-year-old children interpreted the novel word as a shape term when ostensive information was provided but as a colour term when additional information, either contrastive or inclusive, specified a relation between the novel term and a known label for that colour. Additionally, children who consistently interpreted the novel word as a colour word tended to treat the novel and known labels as mutually exclusive colour terms if they heard contrastive information, whereas they tended to treat the words as hierarchically related if they heard inclusion information. Three-year-olds generally did not make use of either type of information in determining the semantic domain of the novel word or the relation between the terms.

The importance of input for word learning was shown in all the previous studies. Nevertheless, the previous studies are characterised by an artificial type of exposure to the novel words (e.g, isolated sentences, single assessments). In the next section, a review of studies using a different mode of presentation of the input, such as stories, follows.

3.2.2 Evidence from listening to stories

Reading stories to preschool children has been recognised, by many researchers, as beneficial to the development of their literacy skills (Clark 1984; Wells, 1986). The longitudinal data from Wells' study (1986) showed that listening to stories at preschool age was positively related to teachers' assessments of vocabulary size at age ten. A lot of research has also concentrated on primary school children, and whether they can acquire specific new vocabulary terms from reading. Only a handful of researchers have looked at whether preschool age children can acquire new lexical items from listening to story readings (Eller, Pappas & Brown, 1988; Elley 1989; Robbins & Ehri, 1994; Senechal & Cornell, 1993; Leung & Pikulski,1990).

Eller, Pappas & Brown (1988) designed a study to explore the process of incidental vocabulary learning. Two illustrated storybooks were used, written by Brian Wildsmith. These were "The Owl and the Woodpecker" and "The Lazy Bear". Twenty target lexical items-ten from each book- were selected based on three criteria: (a) the words were those they judged to be unfamiliar to most young children; (b) words were selected to contribute significantly to the message of the text; (c) the selected words were used frequently enough in the children's readings so that growth could be documented.

Prereading kindergarten children were read two illustrated storybooks by an adult on three separate occasions (per book). Then they were invited to take a turn at reading it themselves. As the children were all nonreaders, it was suggested that they read in their own way, in other words "pretend reading". Using an ordinal category system developed for the study, three analyses of the three "readings" of each book were made which identified patterns of vocabulary growth.

The system consisted of five general categories organised along an ordinal continuum. (1) *No/Faulty knowledge*:Indicates no knowledge or a faulty knowledge of the words' meaning; (2) *Developing knowledge*: Indicates developing knowledge of semantic and syntactic features of the word, but knowledge still seems incomplete or faulty; (3) *Synonym*:Indicates that the child has obtained semantic and syntactic information about the word from the context, but is still using a more familiar word to impart his/her message; (4) *Accurate knowledge*: Indicates not only an acquisition of accurate semantic information about the word, but also that this information may be internalised so that the target word is now used appropriately within the given context;(5)*Generalised knowledge*: Indicates that generalization may have occurred in that the word was used accurately in both given and other contexts within the text;

According to the researchers of the above study, children were not simply repeating the words, but using them in increasingly complex structures indicating acquisition of syntactic and semantic information from listening to the readings. According to them, the difference from the first to the later sessions supports the notion that incidental vocabulary learning is a gradual process.

However, the study has many limitations. After the children had listened to the same stories several times, each child was asked to read the story aloud. Because the children were nonreaders, they "pretend read" the stories by turning the pages and recalling the stories from memory. In their pretend reading of the stories, the children were observed to use the language of the stories including words considered unusual in kindergartner's discourse. This was taken as evidence by Eller et al. (1988) that the children had acquired new vocabulary from listening to the stories.

However, use of the novel words in only one situation does not prove that had acquired the full meaning of the words. Otherwise, they should have employed different tasks which would show whether they had grasped all the different aspects of the words' meanings. Furthermore, it is unclear whether this model of development they propose would be valid for the acquisition of new lexical items since it is not clear, if we consider the criteria they used, that the words were unknown to the children. The data for this investigation were extracted from a larger study, and consequently no pretesting of the target vocabulary words was undertaken, so the children's previous knowledge of these words was not known. Furthermore, no post-testing was undertaken to see whether this type of performance was still present a week later. Besides, because "bona fide" children's literature was used, the number of encounters with the target words could not be controlled.

Leung and Pikulski (1990) studied the extent to which kindergartners and first graders could identify the meanings of novel words that they heard in stories. They replicated the Eller et al's (1988) study by using the same two picture storybooks, but they also used a pretest / post test design that included controls who did not hear the stories. After hearing each story, participants from the experimental group were asked to give the meanings of 20 target words from the stories before and after the experimental treatment.

Results support Eller et al's (1988) findings that repeated exposure to stories increased children's use of target words in their pretend readings. However, there was no significant difference between the experimental and the control groups in vocabulary gain as evidenced by subjects' ability to verbally define the target words. Leung and Pikulski suggested that vocabulary gains might have been demonstrated if the design had used a multiple choice test of word meanings. In other words, a different measurement of word knowledge (a more moderate one such as a multiple choice test) could alter the results.

That raises issues of the methodological problems that a researcher faces when attempting to measure word knowledge.

Elley (1989) tested the hypothesis that 7- and 8-year-old children would learn the meanings of many new words that they heard in stories read aloud - without explanation of such words. An additional aim of the study was to attempt to identify word-related and subject-related variables, that correlated with vocabulary gain. The book chosen to be read to the classes, *Gumdrop at sea* by Val Biro (1983), was considered appropriate because it had been published recently, it had an appealing story and many attractive pictures, and it used at least 20 words thought to be unknown to the target population. Pupils' understanding of the difficult words was pretested on a multiple-choice test. The story was read three times to each class over a period of 1 week. In the first reading, the teacher led an initial discussion of the title, cover pictures and main characters. No definition or explanation was given of any target word. The second reading three days later was conducted by the pupils' own classroom teacher, following the same pattern. The third reading, on the seventh day, was given by the first teacher, who again showed the pictures but also allowed some time for predictions and remarks by the children.

The same multiple choice test was given, 2 days after the third reading, as a post-test. The scores for most target words were higher on the post-test than on the pretest, with a mean increase of 15.4%. The words that were most readily learned in the story were those for which the surrounding context was helpful, those that occurred more than once in the story, and those that were illustrated in at least one picture. Elley (1989) concluded that reading stories aloud was a significant source of vocabulary acquisition. Nevertheless, there are a number of limitations in this study. Firstly, all the results are questionable since they did not use a control group. Generalizabilty also is limited because of (a) the use of only one book, and (b) of the fact that the permanence of the new learning was not assessed.

Elley (1989) carried out a second experiment in order to overcome some of the previous limitations. Her first aim was to confirm the phenomenon of incidental vocabulary learning found in Experiment 1 with two different story books. The second purpose was to estimate the effects of teacher's explanation of unfamiliar words, over and above the effects of story reading alone. The third purpose of her second experiment was to clarify further the contribution of the word-related and subject-related variables. The last purpose of her study was to investigate the permanence of any learning that occurred.

The experimental design was devised to compare the effects of reading the stories aloud with and without explanation of unfamiliar words. In group A (*reading with explanation*) the teachers read the stories and explained the meanings of the target words as they occurred. In group B (*reading without explanation*) the teachers read the stories without explaining the meanings of the target words. These two treatments were crossed with two stories for the two experimental groups. Again, each story was read three times, and the post-test occurred seven days after the last reading. Group C (the control group) took all tests at the same times as Group A and B but heard neither story. Three months later, the delayed post tests were given to one class in group A and one class in group B.

Elley (1989) found that having a teacher explaining words as they are encountered gave more than double vocabulary gains, and that this learning was relatively permanent. However, that kind of learning was not incidental, since the teacher was explaining the meanings of the words. She also found that the lowest in baseline vocabulary ability group improved more than the highest in baseline vocabulary ability group. However, she only used one measure of word learning which was a multiple choice test. No production measures were administered, and no control over the unknown words was taken.

Robbins and Ehri (1994) carried out a study in order to extend the line of research regarding the effects of listening to stories on children's vocabulary growth. Kindergartners listened to a story- *The boy who cried wolf* - twice and then completed a multiple choice vocabulary test assessing their knowledge of eleven unfamiliar target words occurring in the story. Comparable words not appearing in the story were included as controls in the test. Some target words appeared twice in the story and some only once. Children's existing vocabulary was assessed with the Peabody Picture Vocabulary test. The children recognized the meanings of significantly more words from the story than words not in the story, thus indicating that storybook reading was effective for building vocabulary. It was also found, that children with larger vocabularies learned more words than children with smaller vocabularies. The absence of a delayed post-test means that it is unknown whether this learning persisted over time.

All these studies involved one or more repeated readings of the story concerned. However, Senechal and Cornell (1993) investigated whether children could learn new vocabulary from a single reading of a storybook. They also considered the effects of four reading conditions: I) adult reads book verbatim with child encouraged to listen passively, ii) adult repeats target words to emphasize them, iii) adult reads target word and recasts it as a synonym, and iv) adult asks child questions about the target word. Four and five year old children were pretested for target word knowledge, then read a storybook (containing the target words) on a single occasion, in one of the four conditions presented above. Post-tests of receptive language were administered immediately after reading, and again one week later. Children knew few words of the pretest and showed a significant increase on the immediate post-test, with a slightly higher increase on the delayed post-test. Verbatim reading was as effective as the other reading conditions.

In another study Senechal (1997) investigated the differential effect of storybook reading on preschoolers acquisition of expressive and receptive vocabulary. Three- and four-year-old children were read one storybook individually. The study included three storybook reading conditions: single reading, repeated reading, and questioning. Each storybook was read three times. Listening to multiple readings facilitated children's acquisition of expressive and receptive vocabulary, whereas answering questions during the multiple readings was more helpful to the acquisition of expressive than receptive vocabulary.

Furthermore, Senechal has proposed a model about how a child extracts word meanings from context. According to the model, the child must:(a) encode and maintain a phonological representation of the novel word; (b) extract clues from the semantic, syntactic and pictorial contexts to constrain memory search for potential meanings in the case of learning synonyms for known referents and to facilitate the inferential process in the case of novel referents; © select or construe a potentially appropriate meaning; (d) associate the inferred meaning with the phonological representation of the novel word; and (e) integrate and store the new knowledge with the existing knowledge base (Senechal, Thomas & Monker, 1995).

All the studies discussed in this section have explored the role of verbal input for learning new words through listening to stories. However, many studies have shown that other factors are involved in the acquisition of new vocabulary, such as phonological memory and pre-existing vocabulary (Gathercole and Baddeley, 1989; Gathercole and Baddeley, 1990; Michas and Henry, 1994; Robbins and Ehri, 1984; Elley, 1989).The effects of these factors in the word learning process are discussed in the next sections.

3.3 The role of phonological memory in word learning

Learning one's native language clearly involves acquiring the phonological as well as the semantic properties of new words. There has recently been considerable interest in the cognitive processes and mechanisms involved in constructing a representation of the sound structure of a previously unfamiliar word in lexical memory. One consistent finding is that during early and middle childhood, at least, there is a close link between children's abilities to retain new phonological information (such as the single non-words *woogalamic* or *loddernaypish*)for very short period of times and their vocabulary knowledge. Thus, children with good skills at repeating non-words typically have greater knowledge of words in their native vocabulary than those with poor non-word repetition skills (Gathercole & Adams,1993,1994; Gathercole & Baddeley, 1989; Gathercole & Baddeley, 1990; Gathercole et. al. 1991; Gathercole et. al. 1992; Michas & Henry, 1994).

One account is that this relationship between non-word repetition and vocabulary acquisition reflects the contribution to both skills of the phonological loop component of working memory, a system specialized for the temporary maintenance of incoming verbal information. It has been suggested that non-word repetition provides a particularly useful measure of child's short-term memory abilities (Gathercole & Baddeley, 1989). According to Gathercole et. al. (1997) as there are no stored phonological representations of non-words in the mental lexicon, immediate repetition of their unfamiliar sound patterns can be mediated only by the phonological loop. In contrast, for immediate memory tasks involving familiar words, lexical knowledge appears to be used to supplement temporary representations in the phonological loop (Hulme et. al. 1991; Roodneys et. al. 1993). According to this analysis, non-word repetition therefore provides a more sensitive assessment of phonological capacity than does the more conventional measure of verbal short-term memory function of digit span which use familiar words as memory stimuli.

There is a growing body of evidence indicating the involvement of phonological memory in children's vocabulary acquisition. Gathercole and Baddeley (1989) in a longitudinal study, measured the vocabulary level and the phonological memory of 4- and 5- year-old children. The phonological memory measure used in that study involved the repetition of single non-words. They found that vocabulary scores were highly correlated with phonological memory scores at age four and five.

In another study, Gathercole and Baddeley (1990) studied new vocabulary learning in an experimental setting. They explored the possibility of a causal relationship between phonological memory and vocabulary acquisition by testing the abilities of children high and low in repetition performance, to learn labels for unfamiliar toy animals. In this study, children were presented with novel toys which were given specific names. They were either familiar boys' names (e.g., *Thomas, Michael*) or invented two syllable words (e.g., *Meton, Pimas*). The task was simply to learn the name to go with each toy. First, the children were repeating the names and they were asked to give a label for them. The low repetition children were found to be slower at learning phonologically unfamiliar names such as "*Pimas*" for the toys, although there was no difference in learning speed for familiar names such as "*Thomas*". The two groups also differed one week later in their retention of labels that had initially been learned. These results suggest that immediate memory processes are directly involved in the learning of new vocabulary items in young children.

Michas and Henry (1994) also, investigated whether phonological memory could predict children's ability to learn new words. The children were introduced incidentally to a new colour term, followed by the explicit instruction of three new words and their definitions. The children were then tested on word production, comprehension and recall of the definitions immediately and one week later. Phonological memory was found to be a significant predictor of the ability to learn new words as tested by production and delayed comprehension measures for explicitly taught words. However, it did not predict word learning for the incidentally introduced words. The fact that phonological memory predicted word learning for the explicitly taught but not the incidentally introduced words, raises questions about the findings. Maybe other factors such as the specific instruction, and children's pre-existing knowledge of the words rather than phonological memory alone contributed to that learning.

Furthermore, Gathercole, Service, Hitch and Martin (1997) attempted to provide a more systematic and detailed investigation of the relationship between phonological short-term memory and new word learning, with four experimental word learning tasks that vary systematically the amount of new phonological information to be learned by 5- year-old children. Measures of the children's performances on two measures of phonological memory (digit span and non-word repetition), vocabulary knowledge, and nonverbal ability were also obtained. They found that the phonological working memory plays a significant role in the long-term learning of the sounds of new words. The effects of the existing vocabulary knowledge will be discussed in more detail in the following section.

3.4 The effect of existing vocabulary knowledge in word learning

An interesting question is whether the child's existing vocabulary prior to testing will influence the gain in listening to stories. Gathercole et. al. (1997) administered among others the BPVS, in order to investigate the effects of children's existing vocabulary for novel word learning. They found that children's existing lexical knowledge plays a significant role in the long-term learning of the sounds of new words. Nevertheless, in this study, the novel words were not presented in a story but in a sentence context.

Robbins and Ehri (1994) administered a standardised vocabulary test (PPVT-R). Scores on this test were found to be the only subject-related variable to affect the amount of words learnt from the story. Particularly, children with larger vocabularies learnt more new words than those with smaller vocabularies.

This effect of vocabulary size on word learning found in Robbin and Ehri's study is what Stanovich (1986) called a "Matthew effect", where the rich get richer while the poor get poorer. He explained it as a reciprocal relationship; development of vocabulary facilitates reading comprehension, and reading comprehension feeds into vocabulary growth. The current knowledge base is of great importance in acquiring new information. A rich elaborated knowledge of words will assist the inference of meanings of unfamiliar words, allowing effective use of context cues. These cues boost incidental learning, thus expanding the child's knowledge base.

Discussion of all the current experimental evidence about vocabulary acquisition raises an important issue, that of assessing vocabulary knowledge. The next section is about the assessment of vocabulary knowledge, by focusing firstly on the limitations of the current measurements and then to the introduction of alternative methods.

3.5 Assessment of vocabulary knowledge

A critical and at the same time practical question is how word knowledge can be assessed, or what kind of measures allow judgement that a word is known. One persistent difficulty in assessing vocabulary knowledge is the differing criteria used to determine that a word is acquired or known. As noted by Drum and Konopak (1987), "access to word knowledge cannot be compared to an on/off toggle switch" (p.79). The learner's success in comprehension or production tasks may be depend on the type of information available to the learner and the type of response required. In the following subsections the multiple-choice test and other measurements are discussed. This is followed by a discussion of alternatives to the traditional measures.

3.5.1 Limitations of multiple-choice test measurement

The most widely used measure of word knowledge for vocabulary research is the multiple-choice format, in which the child selects a picture for a target word from among several choices (usually four). The assessment of an individual's word knowledge resulting from a multiple-choice test provides us with only a partial understanding of children's knowledge of the target word.

Moreover, the child's word knowledge as measured from a multiple choice test may be greatly influenced by the nature of the distractors. Maybe they present confusions that interfere with what the child knows about a word. On the other hand, if there is a great semantic distance between distractors and the target word, a correct response can be obtained from knowing merely the general domain of the word. Furthermore, multiple choice tests require only a low level of knowledge, and they can make vocabulary knowledge appear "flat", as if all words are either known to the same level or unknown.

That is, correct responses do not differentiate between words that are known well and words that are known vaguely; and incorrect responses do not distinguish between completely unfamiliar words and words about which, one has a glimmer of knowledge, but not enough to distinguish a correct meaning choice.

Kameenui, Dixon & Carnine (1987) evaluated in general the multiple-choice tests in the most pessimistic light by concluding that "such multiple choice vocabulary tasks are useless at best and dangerous at worst" (p.138). Further, they suggest that because so many conclusions about vocabulary learning are drawn from such tasks, one might well question what is really known about vocabulary.

3.5.2 Alternatives to multiple-choice test measurement

In sorting out issues related to assessment of vocabulary knowledge, it is useful to return to the notion that word knowledge falls along a continuum, and to consider where along the continuum word knowledge is assessed by different measures (Beck & McKeown, 1991). It is the case that multiple-choice tests do not measure the full continuum of word knowledge since a multiple choice task taps only at the sense of a word. However, according to Lyons (1977) (see chapter 2) a word's meaning is also characterised by the reference and the denotation-on which a multiple choice task does not tap. There have been several attempts to create assessment techniques that tap the various aspects of word's meaning. A range of such assessments is presented at the following subsections.

Multiple true false tasks

As early as 1942, Cronbach pointed out the need to determine the degree to which a student's understanding of a word was complete rather than merely whether the word was known or unknown. Cronbach (1943) then devised a test based on what he viewed as components of true understanding of a word, which included recognizing examples of its use and how it contrasts with semantically related words. In Cronbach's test, students were asked to distinguish between examples of a word and non-examples that might be confused with the word. For instance, an item to test understanding of the concept "element" asked students to choose examples of elements from among the following: "brass", "iron", "water", "sulfur", "fire", and "oxygen".

Cronbach envisioned the test, which he labelled "multiple true false", as a useful measure of precision of knowledge for technical or content-specific vocabulary. But he also noted its limitations, including difficulty in testing verbs, abstract nouns, and words referring to large entities.

Familiarity tasks

The assessment of precision of word knowledge was also examined by Curtis and Glaser (1983). Their approach involved first presenting items that required only a minimal degree of familiarity with a word, followed by items that required discrimination among related concepts. For example, an item that tested minimal familiarity might require selection of a synonym for desist from among the following: stop, review, consider, debate. A more discriminating item for *"desist"* might then present the following choices: *pause*, *halt*, *prevent*, *discontinue*.

The notion of assessing both vague and precise recognition of word meanings was used by Marshelek (1981) to investigate aspects of vocabulary knowledge in high school seniors. Students' knowledge was assessed through *vague-recognition items* in which all distractors were semantically unrelated to the correct choice; *accurate-recognition items*, in which all distractors were semantically related; and a test of ability to *provide definitions* for words. This variety of measures allowed examination of the distribution of words in various states of knowledge.

Marshelek found that many words could be recognised or defined vaguely but not accurately, or recognised but not defined. More specifically, it was found that often students could give a correct example of a word's use but inferred incorrect defining features and that low-ability students had more words in partial knowledge states than did high-ability students.

Semantic tasks

A similar finding that completeness or precision of word knowledge differentiates high- and low-ability individuals resulted from a study by Curtis (1981). In that study undergraduates took a traditional multiple-choice test and then were interviewed about the tested words. Curtis's interviews included measures of *semantic range* (i.e., whether students could produce any correct associations to a word); and *semantic depth* (i.e., whether they could produce a synonym or correct explanation). Curtis found that low-ability students not only knew fewer of the tested words and had less practice knowledge of the words they knew, they were also able to produce correct explanations for only about half the words they had correct on the multiple choice test. Broader knowledge of words is seen on tasks assessing antonyms, synonyms, hyponyms, semantic attributes.

Antonyms require the student either to use learned word associations (e.g., hot-cold) or to analyse the characteristics of the stimulus and to choose which characteristic is the critical one to oppose. Jorgensen et. al. (1981) suggest that failure to produce antonyms may reflect (a) inability to determine the steps necessary for antonymous responses, (b) difficulty in focusing on the critical semantic dimension, (c) vocabulary that does not include an opposite lexical item for each stimulus, (d) inability to retrieve the opposite term, or (e) difficulty in understanding the meaning of the stimulus.

A synonym task can also be performed with learned responses (purse=handbag) or by completing the analysis steps to find sufficient similarities of attributes. A related task is that of similarities or differences, where the student is asked to choose which items are either similar or different among three or four items and then may be asked to give a reason for their choice. Like the antonym or synonym tasks, the student must have available the appropriate semantic categories, knowledge of membership attributes, and ability to compare/contrast the items by their attributes.

The hyponym is another task that assess whether the child has some knowledge of the domain to which the new word belongs (e.g, does the child knows that beige is a colour word ?) and can make proper contrasts within the domain. In Carey and Bartlett's (1978) hyponym task, children were asked if various words were colours. Questions were of the following type: "Is purple a colour ?" "Is cold a colour ?" "Is noisy a colour ?" A child had to answer all of the questions correctly in order to be credited with knowing that chromium is a colour word. This task proved to be very difficult for the children.

Heibeck and Markman (1987) used also the hyponym measure by asking the children to provide a proper contrast for the new word. For example, children might hear: "See this?

It isn't chartreuse because it's___". If children answered with a colour term, one may infer that they interpreted the new word to refer to colour. They found that most of the children were able to provide proper contrasts for the new words they learned.

Another attribute task is one used by Richard and Hanner (1985) in which the student is asked to tell all that is known about a word and the experimenter prompts the student to use varied attributes (function, size, colour, category, etc.). Although little developmental data are available on the number and the type of attributes that should be expected, this type of task can be useful in observing how words and attributes are organised by the student and particularly which attributes are limited or entirely omitted.

In semantic senseless tasks, the student must know each individual lexical item and each semantic feature, and must use world knowledge to recognize the probable interrelationships of the words in this context. Finally, the student must be able to express what is wrong with the sentence and why it is senseless.

Definition tasks

Curtis (1987) used a definition task to measure word learning. She found that, children first give the use of the item, a description of it, or providing its use in context. Later, children use synonyms or explanations. She suggests that although definition tasks can be a positive addition to single-word vocabulary testing, they also have limitations, particularly when the student is only given credit for complete and conventional definitions.

Rusell and Saadeh (1962) investigated developmental differences in understanding words in terms of three levels: concrete, functional, and abstract. The researchers designed a test that offered a concrete, a functional, and an abstract meaning alternative for each word, as well as an incorrect distractor. For example, the meanings offered for the word "count" were, at the concrete level, "to find how many pennies are in your pocket"; at the functional level, "to find the number of things in a group"; and at the abstract level, "to say numbers in order-upward and downward". The results for third-, sixth-, and ninth-grade students showed the dominance of concrete and functional choices for third graders, and the decline of correct choices along with increases in functional and abstract choices for sixth and ninth graders. Russell and Saadeh's work provides another demonstration of how knowledge about words is not the simple present/absent conceptualization that traditional multiple-choice tests most often measure.

Another study by Graves (1986) compared the number of words children knew on different dimensions of knowledge. These tasks were used to assess three different aspects of the reading vocabulary of primary-grade children. The tasks included a multiple meaning task, in which children were asked to produce more than one definition for a word, a meanings-in-context task, that required children to explain what a word meant within a sentence, and a precision-of-meanings task, which required children to give meanings of two semantically similar words. The three different subtask scores presented a richer picture of the extent of children's knowledge of words than do traditional, single measurement approaches. The results illustrate the multifaceted picture of vocabulary size that can emerge if different dimensions are considered.

Word associations tasks

Word association tasks have also been used to assess word knowledge by examining the children's ability to use categorical processing versus event-based processing. Although the free association task, "cat-dog" can be useful, the most popular association task involves providing a category and asking the student to name as many elements in the category as possible within a specified time period. Richard and Hanner (1985) also suggest asking the student, "what goes with X ?" and encouraging the students to think of any words associated with the target word.

Sentence generation tasks

A measure that assesses, in part, lexical use, is to provide the child with one to three words and ask him or her to make up a sentence. In a variation of this task, Wiig and Secord (1985) first provided a pictorial context (e.g. two people near a park bench) and three words (e.g., sit, painted, because), and ask the child to make up a sentence that fits the situation. With the context provided, the child is prompted to use past experiences to create a sentence.

Categorical knowledge tasks

A final group of vocabulary measures are those which assess categorical knowledge. Keil (1983) used novel words and the inferences made about them to assess categorical knowledge. The kindergarten, second-grade and fourth-grade children heard three sentences about an unfamiliar word (i.e., " The hyrax is asleep"). The children were then queried about the word's meaning (i.e., "Could a hyrax be hungry ?"). The children made fewer inferences due to their limited ontological knowledge.

Nevertheless, although there has been some work on varying approaches to assessing vocabulary knowledge, the use of alternative assessment measures has been limited to small scale tests of their effectiveness and experimental learning studies (e.g., Jenkins et. al.1984; McKeown et. al. 1985; Nagy et. al. 1985). Furthermore, very few, if any experimental studies up to date have investigated word learning in younger ages using a range of methods.

Therefore, large scale studies that characterize the configurations of words in various states of knowledge within individuals and across individuals of different ages and abilities should be employed. Only with such information we can better understand how words are learned, the processes involved in learning and using the words, and the extent of benefits from contextual exposures.

Chapter 4:

RATIONALE FOR THE EXPERIMENT 1

4.1 Introduction

This chapter starts with an overview of the methodological limitations of the studies reviewed in the previous chapter and introduces aims, rationale and research questions of Experiment 1. Then, the aims, methods and results of the pilot study are presented. The chapter concludes with the main findings and implications drawn from the pilot study which will lead to the elaboration of the rationale of Experiment 1.

4.2 Methodological limitations of the previous studies

The studies reviewed in the previous sections demonstrated how context can be used for word learning and particularly that story book reading can be a significant source of vocabulary acquisition. Furthermore, it was shown that word learning is related to the number of exposures, as well as children's entering vocabulary (Elley, 1989; Jenkins et al. 1984; Leung and Pikulski, 1990; Nagy et. al 1984; 1987) and phonological memory (Michas and Henry 1994). Nevertheless, to date the published work contains methodological limitations and a more systematic investigation is needed.

Artificiality of the experiments

Carey (1978), Dockrell and Campbell (1986) and Nelson (1988) have noted that many experimental word learning tasks do not represent the typical ways in which young children interact with adults or the ways in which they typically learn new words. For example, how often do children encounter 12 to 16 new words within one play session and how likely is it that an adult, would name each item 22 times ?

Developmental trends

Most of the studies using stories, up to now have investigated word learning from context using one age group (Elley, 1989; Jenkins et al. 1984; Leung and Pikulski, 1990). In that way developmental differences have not been investigated.

What is in the story context ?

Most of the studies which have shown that children can learn new words from listening to stories (Elley, 1989; Jenkins et al. 1984; Leung and Pikulski, 1990; Nagy et. al 1984;1987) have used already published stories which are appropriate for older children. In that way they have been unable to control and manipulate what is in the story that makes it good for word learning.

Factors such as the role of different linguistic contexts in relation to other cognitive and individual factors have not been examined. Linguistic context refers to the morphosyntactic and/or semantic information available in an utterance. This information can constrain the possible meaning of an unfamiliar word occurring in that utterance (Goodman, McDonough and Brown, 1998). Children appear to use the morphosyntactic and semantic context to infer the meaning of an unfamiliar word prior to 2 years of age (Katz et. al. 1974; Au, 1990).

Target words

It is unclear how the previous studies defined the target words as unknown. Overall, the choice of the target words as unknown was based on assumptions rather than explicit criteria.

Limitations of post-test measurements

Moreover, word learning was usually assessed only through multiple choice test (Eller et al, 1988; Leung and Pikulski, 1990; Elley, 1989; Robbins and Ehri, 1994; Senechal and Cornell, 1993). Multiple choice tests require a non-verbal response and allow limited analysis of the representational status of the lexical item. Furthermore, no repeated measurements have been included to examine word learning over time.

4.3 Aims and rationale for the design of Experiment 1

Experiment 1 was designed to extend the understanding of stories as word learning contexts by assessing child based and contextual factors. According to Crais (1987) using stories to introduce new words and observing which aspects are stored and recalled can illuminate what and how a child learns from context. The use of stories to look at fast-mapping skills can be informative across a wide developmental range, provides a natural context for word acquisition, motivates the children to attend to the task, and permits the systematic manipulation of variables affecting the fast-mapping process.

Particularly, the aim of Experiment 1 was to investigate the nature of the linguistic input (inference, definition, analogy, lexical contrast) in relation to child based factors (phonological memory and existing vocabulary knowledge) and their age for word learning. Furthermore, most of the studies demonstrated word learning from stories by using only a single assessment, mainly a multiple choice test. Experiment 1 aims therefore to demonstrate word learning in more depth using multiple measurements (Naming and Understanding tasks) particularly designed for the purposes of Experiment 1.

Additionally, most of the studies measure word learning immediately after the story session, without measuring whether that learning remains after a longer period. Experiment 1 will investigate word learning over time by measuring word knowledge both in an Immediate and a Delayed post test. The rationale for choosing the above parameters is presented in the following subsections.

Child based factors

Phonological working memory

The role of phonological working memory was investigated since several studies have found that phonological working memory is related with word learning (Gathercole and Baddeley, 1990; Michas and Henry, 1994; Gathercole et. al. 1997). Nevertheless in these studies, the words were presented in a sentence like context, and no developmental differences were investigated. In the present experiment, the novel words were presented in a more naturalistic situation, such as a story reading context. Additionally, developmental differences were investigated. It was expected that children with high phonological working memory will perform better than children with low phonological working memory in the word learning tasks. Developmental differences were also expected.

Existing vocabulary knowledge

There is evidence that children's existing vocabulary affects the amount of novel words that children will learn from a story (Gathercole et al. 1997; Robbins & Ehri, 1994). Nevertheless, the previous studies measured existing vocabulary with different standardised tests (BPVS and PPVT-R) without including different age groups. The present experiment will measure existing vocabulary using the BPVS test (which is appropriate for the target age range) and different age groups.

Nature of the input

Inference context

The context of inference was investigated earlier on by Werner and Kaplan (1952). They looked at 9- to 13- year-old children's abilities to infer the meaning of real, but unfamiliar, words in sentence contexts. The children were presented six different sentences that provided different contexts for each word and were then asked to interpret each sentence in the light of the preceding sentences. Werner and Kaplan found developmental differences in the children's abilities to infer meaning from context and noted that correctness of response increased significantly with increasing age. Extending that kind of research, a simplified form of this task with unfamiliar, concrete words is used in Experiment 1 to investigate the use of inference context to interpret word meaning by younger children (4-to-6 year olds).

Definition context

According to Anderson and Nagy (1991) definitions can make a contribution to the process of word learning. Learning the definition of a word may serve as a foundation for making more effective use of subsequent encounters with that word in context, or help in organising and synthesizing information gained from prior encounters. However, the previous findings come from children who are able to read. Therefore, the contribution of the definition in a story context by different age groups (4 to 6 year olds) is investigated in Experiment 1.

Analogy context

Gentner and Holyoak (1997) claim that analogy is also a powerful cognitive mechanism that people use to make inferences and learn new abstractions. They claim that analogy is the process of understanding a novel situation in terms of one that is already familiar. The familiar situation provides a kind of model for making inferences about the unfamiliar situation. Much of cognition and learning depends on identifying the relevant knowledge which the learner already has in existing memory, so that this knowledge can be used as a starting point for learning what is new (Meadows, 1993).

Researchers from a number of theoretical backgrounds have studied children's analogical reasoning. Levinson and Carpenter (1974) demonstrated that young children can solve what they called *quasi-analogies* such as "a bird uses air, a fish uses ?" The developmental literature centres on understanding or recognising an analogical relation set up by the tester. As Meadows (1993) claims, to elucidate the development of this wider range of analogical reasoning, it may be necessary to explore the area of language development and investigate the ways in which adults present analogies to help children structure new information. Therefore, based on the previous considerations Experiment 1 will investigate the role of analogy for word learning.

Lexical contrast context

The choice of the lexical contrast linguistic context is based on the "Lexical contrast constraint". According to that, as words are acquired, they will be differentiated or contrasted with existing words, and children will assume that different words have different meanings (Clark 1987). Several studies have shown that children acquire word meanings in that way - however in artificial experimental situations (Carey & Bartlett, 1978; Heibeck & Markman, 1987; Au, 1990; Gottfried & Tonks, 1996). In the present experiment novel words will be contrasted with other already known words in a more naturalistic situation, a story context.

The research questions of Experiment 1 were the following:

1. To what extent does children's word learning differ by age ?

2. To what extent does children's word learning differ by the linguistic condition in which the novel word is presented ?
3. To what extent do children retain the words' meaning over time ?
4. To what extent does word learning differ by the children's existing vocabulary ?
5. To what extent does word learning differ by the children's phonological working memory?

However, before carrying out Experiment 1 a pilot study was carried out first to investigate: (a) to what extent the specific linguistic contexts designed particularly for Experiment 1 were appropriate for the children and (b) to test the appropriateness of the target lexical items.

4.3.1 The Pilot study

4.3.2 Method

4.3.2.1 Participants

Fifty eight nursery and reception class children (29 boys and 29 girls) participated in the study. Twenty five had a mean age 4.6 (range 4-5 years) and thirty four of them had a mean age 5.6 (range 5-6 years). The participants were selected from two, State supported, middle class, Primary schools. The children were randomly assigned to four conditions with the constraint that the conditions be roughly equated for age and sex.

4.3.2.2 Design

The children were divided into eight groups which were balanced for age and sex. The first four groups had a mean age of 4.6 years and the other four groups had a mean age of 5.6 years. The conditions that were applied to the first four groups were exactly the same for the other four.

Group I received four stories (one story per lexical item) that included two polysyllabic and two bisyllabic nouns which were replaced by non-words (tangophon, tramacle, feber, sackets). The new lexical items were presented through an *Inference condition.* Group II received four stories where the same non-words were presented through a *Definition condition.* Group III received four stories where the non-words were presented through an

Analogy condition. Group IV received four stories where the non-words were presented through a *Lexical Contrast condition.* The same conditions were applied to the 5.6 year olds (Table 4.1).

Table 4.1 Number of children by age and group

	Linguistic conditions			
	Inference	**Definition**	**Analogy**	**Lexical contrast**
4;6 yr olds	7	6	6	6
5;6 yr olds	10	8	10	6
Total	17	14	16	12

The target words

The unknown lexical items were *saxophone* (three syllables), *tricycle* (three syllables), *teepee* (two syllables), *sandals* (two syllables). The stories introduced the *four unknown lexical items* that were kept the same across all the conditions. Word frequency books (Caroll et. al. 1971; Burroughs, 1957) were used in order to define the unknown words for that particular age range. The above indexes were chosen because (a) they were appropriate for the age range that was the focus of the Experiment; secondly they included words that exist in children's spoken vocabulary which reflects the vocabulary that they have already acquired and; thirdly all the research tradition in that area had used them before (Eller, et. al. 1988; Elley, 1989).

The target words met the following criteria: (1)*Word/Conceptual difficulty*: only concrete words were used; (2)*Word length*: bisyllabic and polysyllabic words were used; (3) *Grammatical case*: nouns were used only. These nouns were replaced by non-words in order to ensure that whatever learning takes place, it will be due to the exposure to the stories. Following Anderson and Freebody (1983) the non-words were made up by changing one or two letters in real words. In the present Experiment, three of the letters of the real word were replaced with three new letters. The non-words that came up were: "*tangophon*" for saxophone, "*tramacle*" for tricycle "*feber*" for teepee and "*sackets*" for sandals.

The stories

The stories were constructed according to the following criteria, which were kept the same across all the linguistic conditions: (1) The non-word appeared in the passage and in the illustrations two times in each story; (2) The length of each story was about 7-9 sentences;

(3) All the definitions used in the definition condition were taken from the Collins dictionary.

To allow for controlled manipulation of linguistic conditions 16 original stories were designed particularly for Experiment 1 - four for each of the linguistic conditions (Inference, Definition, Analogy, Lexical contrast). In the Inference condition, the new word was introduced implicitly through various cues about the meaning of the word. In the Definition condition definition from a dictionary was included in the story context. In the Analogy condition, an implicit introduction of the novel word was made by providing children with an analogy of one aspect of the word with another already known. Finally, in the Lexical contrast condition, the unknown word was implicitly contrasted with two already known words. The original stories are presented in the Appendix 4.1.

4.3.2.3 Materials

The materials used were 16 illustrated stories and 12 coloured pictures.

4.2.3.4 Procedure

The children received a number of tasks in the following sequence:

Stage 1: Pretest: Each child was withdrawn singly from the class and asked to name four pictures that were placed on the table in front of him/her. These included a saxophone, a teepee, a tricycle, sandals, a car, a bicycle, a piano, a guitar, a doll's house and a mobile home. The purpose of this pretest was to ascertain that the children could correctly name the objects that would be used in the lexical contrast condition as known and that they had no correct or consistent lexical entry for the lexical items to be chosen as unknown.

Stage 2: Introducing Task & Post Test 1: The children were again withdrawn singly from the class. Upon entering the testing room the children found four story books on the table. The child sat opposite the Experimenter and was asked to play a guessing game. The experimenter said: "*Let's play a guessing game. I am going to read you a story and then I will ask you some questions about it*". Once the story was completed the story book was removed from the table and children's learning of the new words was measured by the following tasks:

1. Naming task: "What is this ?"
2. Definition task: "What do you think is an x ?"
3. Inference task: "How do we use it ?"
4. Analogy task: "Do you know anything else like that?"
5. Lexical contrast task: "Do you know something else different from this one ?"
6. Multiple choice task: "Can you point at the x ?"
7. Sentence generation task: Prompt in order to make up a sentence.

The four cards that were used for the multiple choice task had the format of the BPVS plates. Each plate showed four pictures. One of them was the target picture, the second one was a phonological foil, the third was a semantic foil and the fourth one was an irrelevant foil. However, in order to control that the children did not choose the target word because it was the only one presented in the illustrations of the story, all the other three pictorial representations of the foils that were presented in the post test were also included in the illustrations of the stories.

Stage 3: Follow-up session-Post Test 2: One week was allowed to elapse before this session begun. The children were again withdrawn from the class under the excuse of playing a game with the experimenter. The experimenter asked the same questions as those used in the introducing event for each target item.

4.3.3 Results

Stage 1: Pretest

All children could correctly identify pictures that were going to be used in the contrast condition. In the case of the target words, all of the items -except from the sackets (sandals) that many children knew the word-were chosen as experimental items because the majority of the children did not know them, and for those children who offered an alternative answer, this was not appropriate. The word sandals was not used in the main study.

Stage 2: Introducing Task - Post Test 1 & Post Test 2

The stories were quite understandable for the children as well as the illustrations. Also, the children showed understanding of the questions they had to answer. The tasks worked well.

Age was found to have an effect on children's performance, since the 5.6 year old children performed better than 4.6 year olds across all the different linguistic conditions (Table 4.2).

Table 4.2 Children's performance (percentages) across tasks by age in the immediate post test

	Naming		Definition		Inference		Analogy		L.contrast		M.choice		Sentence	
Ages	**4;6**	**5;6**	**4;6**	**5;6**	**4;6**	**5;6**	**4;6**	**5;6**	**4;6**	**5;6**	**4;6**	**5;6**	**4;6**	**5;6**
Tang	30	38	39	48	65	66	13	17	13	14	96	91	56	80
Feber	40	45	30	60	48	40	9	20	4	17	91	100	52	80
Tram.	29	43	52	71	65	60	13	26	17	23	83	91	65	86
Sackets	42	50	39	49	57	49	4	5	4	17	83	66	56	66

Abbreviations: L.contrast = Lexical contrast; M. Choice=Multiple choice; Tram.=Tramacle

Differences between bisyllabic and polysyllabic words were found for the younger age group in the production task in both post tests. Bisyllabic words were found to be easier for the 4.6 year olds than the polysyllabic words. Moreover, the specific linguistic structure of the stories had an effect on children's performance. Both age groups tended to answer specific questions only if they had received the relevant input. However, the linguistic conditions were not very clear-cut, something which limited the previous finding and had implications for the Experiment 1.

4.3.4 Conclusions

The pilot study was designed to investigate how different linguistic contexts contribute to word learning. It was found that different types of linguistic context can affect different aspects of word learning. The main implication of that is to test its viability with a bigger population.

Furthermore, for the main study the content of the stories was slightly changed in order to have clear-cut conditions. Thus, the Inference condition provided information only about the question "*What do we do with an x ?*" (Inference task), the Definition condition provided information only about the question "*What a(n) x is* ?" (Definition task), the Analogy condition provided information only about the question *"Do you know something else like this one ?*" (Analogy task), and the Lexical contrast condition provided information only about the question "*Do you know something else different from that one ?"* (Lexical contrast task). The use also of four stories was a very big burden for the children. Thus, two stories only were used in the Experiment 1with interchangeable order of presentation.

4.4. Implications for Experiment 1

The linguistic contexts designed for the pilot study were found to be appropriate for the children, therefore they were also used in Experiment 1. Regarding the target words, the two polysyllabic words posed an extra difficulty for the children in comparison with the two bisyllabic words. Therefore, it was decided to use bisyllabic words only, since those were the words on which the children demonstrated their best performance . The target word "feber" (teepee) was used in the main study, since none of the children knew it in the pilot study. However, the second word "sackets" (sandals) was known by some children, thus, it was replaced with another one of low frequency.

Chapter 5:
EXPERIMENT 1

5.1 Introduction

The chapter begins by presenting the aims and the research questions of Experiment 1. Then, the methods and the results of Experiment 1 are presented. The Results sections begins with the baseline measures and each one of the post test measures and concludes with between and across tests comparisons (for more details about the organisation of the results see the Results section).

5.2 Aims and Research questions of Experiment 1

Experiment 1 was designed to investigate the effect of child based factors (phonological working memory, vocabulary level and age) and the nature of the input for the acquisition of new words. The main research questions of Experiment 1 (as already presented in the previous chapter) are the following:

1. To what extent does children's word learning differ by their age ?
2. To what extent does children's word learning differ by the linguistic condition in which the novel word is presented ?

3. To what extent do children retain the words' meaning over time ?
4. To what extent does word learning differ by the children's existing vocabulary ?
5. To what extent does word learning differ by the children's phonological working memory?

5.3 Methods

5.3.1 Participants

Two hundred and thirty children from three primary schools in London were screened for the Experiment. They had to have English as their first language. At the end, one hundred and ninety two English-speaking children were selected to take part in Experiment 1[1]. Ninety six of them were boys and ninety six were girls. Table 5.1 shows the range of age and the mean ages (in years and months) of the sample by group of intervention.

Table 5.1 Characteristics of the sample (N=192) by group

Groups	Age		Boys	Girls	Total
	Range	Mean			
Inference	3;6-4;6	4.00	8	8	16
	4;6-5;6	5.00	8	8	16
	5;6-6;6	6.00	8	8	16
Analogy	3;6-4;6	4.00	8	8	16
	4;6-5;6	5.00	8	8	16
	5;6-6;6	6.00	8	8	16
Lex. Contrast	3;6-4;6	4.00	8	8	16
	4;6-5;6	5.00	8	8	16
	5;6-6;6	6.00	8	8	16
Definition	3;6-4;6	4.00	8	8	16
	4;6-5;6	5.00	8	8	16
	5;6-6;6	6.00	8	8	16

5.3.2 Design

The design of Experiment 1 is presented in Table 5.2. Experiment 1 had a mixed between subjects within subjects design. The between-subjects variables were the different groups

[1] The rest, 58 children did not take part in the study because they did not meet the criteria to be included (see design section).

(linguistic conditions) age, phonological memory and existing vocabulary knowledge, while the within subjects variable was the time (immediate and delayed post test).

Table 5.2 Design of Experiment 1

Age	Groups	n	Pre-test	Exposure	ImAss.	De.Ass.
3;6- 4;6 yrs	**Inference**	16	√	Inference	√	√
	Analogy	16	√	Analogy	√	√
	Lex.contrast	16	√	Lex.contrast	√	√
	Definition	16	√	Definition	√	√
4;6 - 5;6 yrs	**Inference**	16	√	Inference	√	√
	Analogy	16	√	Analogy	√	√
	Lex.contrast	16	√	Lex.contrast	√	√
	Definition	16	√	Definition	√	√
5;6 - 6;6 yrs	**Inference**	16	√	Inference	√	√
	Analogy	16	√	Analogy	√	√
	Lex.contrast	16	√	Lex.contrast	√	√
	Definition	16	√	Definition	√	√

Abbreviations: Im.Ass = Immediate assesment; De.Ass = Delayed assessment; Lex. Contrast= Lexical contrast

Target and Control words

In order to be included in the study the children had to fail the multiple choice pre-test both for the target (oboe and teepee) and the control words (beret and hatchet).The reason for that was to identify the children who already knew the target words and exclude them from the Experiment. The multiple choice pre-test had four trials, two trials for the target words (oboe and tepee) and two trials for the control words (beret and hatchet) (Appendix 5.1). Since children can succeed on multiple choice tasks for a variety of reasons (including guessing) to provide evidence of learning, it was necessary to compare children's performance with items where no input was received (control words).

The choice of the target lexical items had to meet certain criteria. First, the target words were of *low word frequency* according to different indexes (Burroughs, 1957; Caroll, Davies, & Richman, 1971). Those indexes were appropriate for the age range the experiment focused on, and included words that exist in children's spoken vocabulary, which reflects the vocabulary they have already acquired. Children's targets word knowledge was also pretested through a multiple choice test. The children who succeeded in the multiple choice pre-test were excluded from the Experiment 1. Another criterion was that the target words had the *same level of conceptual difficulty and grammatical case* (they were concrete words-nouns-so that comparison with other studies could be established). Furthermore, the target words had the *same word length* (two syllables). The particular choice was based on previous findings from the pilot study that words with one or two syllables are learned more easily than polysyllabic words. Last, both target words were characterised by *morphological transparency* (both of them were unanalysable - so that comparison could be established with other studies).

The stories

To allow for controlled manipulation of linguistic conditions eight original stories were designed specifically for the Experiment 1 (two for each of the linguistic conditions, Inference, Analogy, Lexical contrast, Definition). The structure of the information given in each linguistic context is presented in Appendix 5.2.

Each story book contained one unfamiliar object-word per story. The stories were designed according to the following guidelines which were consistent across all four linguistic conditions: (a)The target word appeared twice in the texts as well as twice in the illustrations; (b) The length of each sentence and the story length was the same for all the stories. Each story was about 7-9 sentences long; (c) All the definitions used in the definition condition were taken from the Collins Dictionary.

British Picture Vocabulary Scale

The Long Form of the British Picture Vocabulary Scale (BPVS) (Dunn & Dunn, 1982) was used. This is a test of hearing vocabulary for standard English. It is also an achievement test in that it makes an assessment of the extent of vocabulary acquisition. It was chosen because it measures the level of vocabulary acquisition and it is appropriate for pre-school children. The Long Form of the BPVS consists of 150 items and additional practice trials. An example of the BPVS form is given in the Appendix 5.3.

Test of Non-word Repetition: A test of phonological working memory

The children's Test of Non-word Repetition (Gathercole and Baddeley, 1996) was initially developed to provide a simple test of immediate memory skills. It is suitable for use with children aged between four and eight years who are attending mainstream schools. The aim of the test was to measure these immediate memory skills. The form for the phonological memory test used is given in the Appendix 5.4.

Post test measurements

The children from each age group were randomly allocated to one of four groups (Inference group, Analogy group, Lexical contrast group, Definition group). The intervention took place over a period of one week. Children were assigned to Immediate assessment after each intervention and delayed assessment one week later without any further intervention. Children's word knowledge was assessed through seven tasks. Assessing took place twice. Once after the exposure (Immediate post- test) and one week later (Delayed post-test). The order of the tasks presentation was the same for all the children across sessions, so that any order effects would be balanced across children. The measurements used are presented in the Table 5.3, while the record form for the post-test measurements is presented in Appendix 5.5.

Table 5.3 Post test measurements of Experiment 1

Measurement	Question
Naming task	*What is this ?*
Inference task	*What do we do with this ?*
Analogy task	*Do you know something else like this ?* (tell me)
Contrast task	*Do you know something else different from this one ?* (tell me)
Multiple choice task	*Show me the x.*
Definition task	*What do you think a(n) x is ?*
Sentence generation task	*Why do you think they go together ?* (a prompt question was used: *"Which of these two other pictures goes best with this one* (target item)?"

Naming task was used to test children's phonological knowledge of the target words as well as to describe the different responses that children gave to the naming task through an error analysis. Inference task was used to assess children's understanding of the target words' meaning. Analogy task was designed to investigate to what extent children were able to relate the target words with others from the same semantic category in terms of similarity. The contrast task was used to identify to what extent children were able to relate the target words with others from the same semantic category (in terms of contrast), as well as to explore all the other different sorts of relations they would provide. The aim of the multiple choice task was to assess children's comprehension of the target words. Definition task was used to explore whether the children had understood the meaning of the novel word by defining it verbally.Another aim of the task was to explore the different properties mentioned in children's definitions. Through the sentence generation task children's ability to use the new term in an appropriate sentence context was investigated. How they referred to the target word and the types of relations provided in the story were also explored.

5.3.3 Materials

The target words

The target words were two nouns "oboe" and "teepee". These words were replaced with non-words, so that any learning could be attributed only to the exposure of the children to the experimental situation. The target word oboe was replaced with the non-word "abez" and the target word teepee was replaced with the non-word "feber".

British picture vocabulary scale

Booklets of pictures and record forms for the long form were used as well as a plastic stand to present the pictures. A manual including a large number of tables and a pencil were also used.

Test of non-word repetition: A test of phonological working memory

An audio cassette recorder of reasonable quality, situated on a table next to the tester, the audio tape of the test items, a record form, and a pen to complete the score sheet were used.

Target and control vocabulary multiple choice pre-test

Four different card plates were constructed for each of the target and control words. Each plate included four pictorial representations (one for the target word, a phonological foil, a semantic foil and an irrelevant foil). A record form and a pencil were used (Appendix 5.6).

Post test measurements

Naming task: Four different cards presenting the pictures of the target items were used.

Multiple choice task: Two plates with four pictures in each one of them.

Analogy task: Two pictures of the target words were used.

Lexical contrast task: Two pictures of the target words were used.
Definition task: No materials were used.

Sentence generation task:
Two pictures of the target words as well as four other pictures for prompting were used. For each target word, one of the other pictures was taxonomically related with the target word and the other was thematically related with the target word.

5.3.4 Procedure

The present section is divided into three parts. The first part presents information about the general testing procedure. In the second part the pre-test and intervention procedures for the different groups (linguistic conditions) are described. In the third section, the procedures for the post-test measures are presented.

5.3.4.1 General testing procedure

The experimenter was introduced to the class by the class teacher. Children were tested individually in a room separate from the classroom. At the start of the testing session, a few minutes were spent in a general conversation with the child, to put him or her at ease. All the tasks were introduced to the child as "games". The child was assured that this was not a test, and there were no right or wrong answers.

Children were tested in three separate sessions. Sessions were conducted one week apart. Each session lasted from 15 to 20 minutes. In the first session three pre-test measurements took place. The order of the measures was kept the same for all the children. The BPVS (British Picture Vocabulary scale) test was first, then the target vocabulary pre-test (screening test). The BPVS test was always given before the target vocabulary pretest, because the BPVS is designed to start with words that the child knows, thus familiarising the children with the procedure and keeping them relaxed. Then they were given the target and control vocabulary pretest. Last, the children were tested on the non-word repetition test.

5.3.4.2 Procedure for the Pre-test measures

British Picture Vocabulary Scale

In each trial the child was presented with plates which presented four pictures (the picture of the target word, a semantic foil, a phonological foil and an irrelevant foil). The children were asked to play a "word game", which in fact was the administration of the BPVS. In that game they had to point to one out of four pictures to indicate the word spoken by the experimenter (e.g. *Can you show me the x ?*"). The test took a maximum of five minutes.

Target and control vocabulary pre-test

Each child was told that he/she was going to play a game with the puppet. Then the puppet asked the child *"What do you think this is ?*" (pointing at the target words).

Test of Non-word Repetition: A test of phonological working memory

The test contains 40 non-words, each of which is presented on the accompanying audio cassette tape. The child listens to each non-word and then is required to attempt to repeat it immediately, in the silent interval that follows the spoken presentation of the word on the tape. The experimenter introduced the test by saying:

1. "*I would like you to help me. When I switch on this cassette recorder in a minute (point to recorder), you will hear a funny made-up word. I would like you to say the funny word back to me as soon as you have heard it. So, if the made-up word you heard was "noop", you should say "noop" back to me. Let's try that now, shall we* ?
2. *"Noop*"(child attempted repetition). If repetition attempt was incorrect, the experimenter said:
3. *"That was a good try, but it wasn't quite right. Let's try again"*. The procedure described in 2 was repeated until a satisfactory repetition attempt was made by the child to this.
4. "*Very good. Now, let's switch the tape on and hear some more made up words".*

The experimenter asked the child "are you ready?" and then switches on the cassette recorder.

The tape began as follows: "*Hello. In a few seconds you will hear a funny made-up word. Please say the word aloud yourself as soon as you hear it" Now here's another one. Repeat*

it after me. Now, you will hear me say some more of these words. Repeat each word as soon as you hear it, and then wait for the next word. Are you ready ?
The procedure was repeated for the remaining items in the test. Following the last item, the tape concluded with: "*That's all now. Thank you*".

As soon as the screening tests were completed (during the first week), the children from each age group were assigned randomly to four independent groups (Inference, Analogy, Lexical contrast, Definition). The second week, the children from each independent group were invited by a puppet to listen to two nice stories. Each child was told to listen carefully, while the puppet was telling the story. Each story introduced a new term in an illustrated story book context. The stories varied in the way in which linguistic information was used to introduce the new terms.

5.3.4.3 Procedure for the groups

Inference group
The children in the Inference group were read stories where the new words were introduced implicitly through various cues about the meaning of the word. The experimenter invited the child to listen to a story by the puppet.

Analogy group
Children in the Analogy group were read a story where implicit information about the novel words were given by providing them with an analogy of one aspect of the target word with another already known (e.g...we blow the abez like we blow the flute...).

Lexical contrast group
Children in the Lexical contrast group, were read stories where the new words were contrasted with two already known words (e.g.....He was playing neither a piano, nor a guitar. He was playing an abez...)

Definition group
Children in the Definition group were read a story about the new words which included a definition about them.

5.3.4.4 Procedure for the post test measures

Naming Task

Each child was told that he/she was going to play a game with a puppet. The experimenter then laid down the two cards one by one on the table in front of the child. Each time the puppet was asking the child: *"What is this ?"*(pointing at the target picture). If the child said "*I don't know*" the experimenter asked him/her to think what it was like.

Inference task

Each child had to answer two questions. S/he was asked to tell the puppet *"What do we do with the x (target word)?".*

Analogy task

Each child had to answer two questions for the puppet. Each child was asked *"Do you know something else which is like the x (target word)?".*

Lexical contrast task

Each child had to answer two questions for the puppet. S/he was asked "*Do you know something else which is different from the x (target word)*?".

Multiple choice task

The multiple choice task had two trials. Each child was asked to play another game with the puppet. S/he was presented with each one of the four plates and s/he was asked: "*Can you point at the x?*" (the picture of the target word).

Definition task

Each child was asked two questions by the puppet who had no idea what certain items (target words) were. S/he was asked: "*Do you know what an x is ?*" The child could offer an answer or say "*don't know*".

Sentence generation task

The sentence generation task had two trials. For each trial, the children were presented with the well known Markman's and Hutchinson's format of forced choice task first, as a prompt.

They were shown the picture of each of the target words and two other pictures,one categorically and one thematically related to the target word. For example in the case of the oboe, they were shown a picture of a flute (taxonomically related) and a picture of a child (thematically related). Then they were asked *"Which of these pictures do you think go best with this one (picture of the target word)?"*. Once they chose, then they were asked to justify their choice *"Why do you think they go together ?"* In that way they were producing a sentence which included the target word.

5.4 Results of Experiment 1

The results are divided into four sections. The first section considers the *baseline measures* (British picture vocabulary scale and test of non-word repetition).The second section considers the *Production measures* (Naming task). The third section considers the *Comprehension measures* (Inference, task, Analogy task, Contrast task, Sentence generation task, Multiple choice and Definition task).The fourth section explores general trends and consider comparisons between and across measures. All of the research questions were explored for each post-test measure. The structure of the presentation of the results is as follows:

1. To what extent does children's word learning differ by their age ?
2. To what extent does children's word learning differ by the linguistic condition in which the novel word is presented ?
3. To what extent do children retain the words' meaning over time ?
4. To what extent does word learning differ by the children's existing vocabulary ?
5. To what extent does word learning differ by the children's phonological working memory ?

Relevant statistics will be presented for each one of the questions. In general, non-parametric statistics were applied except in cases where the variances among groups were equal (according to Levene test) then Parametric statistics were used. Where non-parametric statistics were used, these were the Wilcoxon test, the Kruskal-Wallis 1-Way ANOVA and Friedman test. Because non-parametric tests are less sensitive to significant differences, I report as significant anything which is $<.05$ and as trend anything between $>.05$ and $<.07$. All the other differences are described as non-significant.

Where parametric tests were used, these were the parametric 1-Way-ANOVA (Bonferroni test was used for the post hoc analysis, which has a significance level of .05), T-test for paired samples and for independent samples. Then, where appropriate, an Error analysis was carried out.

5.4.1 The Baseline Measures

Scoring criteria for the (BPVS) British Picture Vocabulary Scale

In the BPVS the children had to point to one out of four pictures to indicate the word spoken by the experimenter. The basal point was where there were 6 consecutive correct responses and the ceiling was where out of 6 consecutive responses there were 4 errors. Children's raw scores in the BPVS were transformed into standardised scores. The standardised scores were coded into low existing vocabulary and high existing vocabulary. The splitting into high and low was made according to a stem and leaf chart where half of the sample belonged to one level and the other half belonged to the other level. Low existing vocabulary was given if a child scored less than 84 (standardised score) and high existing vocabulary was given if a child scored more than 85 (standardised score). The cut-off point was 1 standard deviation +/- the mean.

Scoring of the Test of Non-word Repetition: A test of phonological working memory

The test administrator scores each of the 40 repetition attempts as either correct or incorrect, and calculates a single score at the end of the test which corresponds to the total number of correct repetitions. Each child could get a score from 1-40. Children's raw scores in the phonological memory test were transformed into the standardised scores[1]. The standardised score was coded into low level phonological memory and high level phonological memory. The splitting into high and low was made according to a stem and leaf chart where half of the sample belonged to one level and the other half belonged to the other level. Low phonological memory was given if a child scored less than 127 (standardised score) and high phonological memory was given if a child scored more than 130 (standardised score). The cut off point was 2 standard deviations +/- the mean.

5.4.1.1 British Picture Vocabulary Scale

Table 5.4 presents the groups performances on the British picture vocabulary scale. The table shows that children's existing vocabulary from all the different subgroups (age and group) did not differ.

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[1] High scores in the phonological working memory test raise concern about the test.

Table 5.4 Children's performance (standardised score in means and sds) in the British picture vocabulary scale by group and age

	3;6-4;6 yrs		4;6-5;6 yrs		5;6-6;6 yrs	
	Mean	**Sd**	**Mean**	**Sd**	**Mean**	**Sd**
Inference	91.8	(12)	88.5	(12.2)	79.3	(12.6)
Analogy	88.6	(10.4)	86.1	(14)	83.4	(16.7)
Lex.contrast	91.2	(15.6)	86.3	(7.4)	88.6	(16.9)
Definition	84.8	(10.7)	85.2	(15.9)	90	(14.9)

Abbreviations: Lex.Contrast = Lexical Contrast

Statistical comparisons (T-test for Independent samples) between linguistic conditions within each age group revealed no significant differences except for the oldest age group. Particularly, the Definition group from that age had a significantly higher existing vocabulary than the children from the Inference group of the same age ($t=2.2$, $df=30$, $p<.05$). Statistical comparison within each linguistic condition between age groups was also carried out. No significant differences were found.

5.4.1.2 Phonological Working Memory test

Children's performance on the phonological working memory test was also explored. The following table presents children's performance on the phonological memory test.

Table 5.5 Children's performance (standardised score in means and sds) on the phonological memory test by group and age

	3;6-4;6 yrs		4;6-5;6 yrs		5;6-6;6 yrs	
	Mean	**Sd**	**Mean**	**Sd**	**Mean**	**Sd**
Inference	127.6	(10.6)	119.3	(20.5)	120	(17.6)
Analogy	123.6	(13.5)	124.6	(14.9)	128.7	(8.7)
Lex.contrast	117	(20.8)	128	(12)	123.8	(12.3)
Definition	119.9	(16.4)	124.1	(20)	125.1	(12)

As the above table shows, children's memory scores from all the different subgroups (age and group) did not differ. Statistical comparisons between linguistic conditions within each age group revealed no significant differences. Furthermore, statistical comparisons between age groups within each linguistic condition revealed no significant differences as well.

5.4.1.3 Comparison between children's performance on the control and the target words

Children's performance on the control and the target words was compared using the multiple choice test. Table in the Appendix 5.7 presents children's performance for both types of words across testing in the Multiple choice task by age and linguistic condition.

As the Table (in the Appendix 5.7) illustrates children performed better on the target than the control words. Statistical analysis during the pre-test revealed no significant differences in children's performance for the control and target words. On the other hand, the children performed significantly better on the target than the control words during the Immediate (Wilcoxon: $Z=11.9$, $p<.0000$) and the Delayed post test (Wilcoxon: $Z=11.2$, $p<.0000$).

Whether the same pattern was evident within each age group was also investigated (see Table in the Appendix 5.7). No significant differences were found for children's performance in the pre-test. On the other hand, each age group during the Immediate post test performed significantly better on the target than the control words [4 year olds: Wilcoxon: $Z=6.9$, $p<.0000$; 5 year olds: Wilcoxon: $Z=6.9$, $p<.0000$; 6 year olds: Wilcoxon: $Z=6.9$, $p<.0000$). Furthermore, the same pattern was found during the Delayed post test [4 year olds: Wilcoxon: $Z=6.5$, $p<.0000$; 5 year olds: Wilcoxon: $Z=6.3$, $p<.0000$; 6 year olds: Wilcoxon: $Z=6.6$, $p<.0000$].

To what extent the same pattern was evident within each linguistic condition was also investigated (See Table in the Appendix 5.7). No significant differences were found between children's performance on the pre-test. On the other hand, children from each linguistic condition performed significantly better on the target than the control words both in the Immediate (Inference: Wilcoxon: $Z=5.9$, $p<.0000$; Definition; Wilcoxon: $Z=6.03$, $p<.0000$; Analogy: Wilcoxon: $Z=6.03$, $p<.0000$; Contrast: $Z=6.03$, $p<.0000$) and the Delayed post test (Inference: Wilcoxon: $Z=5.7$, $p<.0000$; Definition; Wilcoxon: $Z=5.5$, $p<.0000$; Analogy: Wilcoxon: $Z=5.7$, $p<.0000$; Contrast: $Z=5.5$, $p<.0000$). Based on the previous analysis, the results which follow refer on children's performance to the target words only.

5.4.2 The post test measures

5.4.2.1 The Production measures

5.4.2.1.1 Naming task

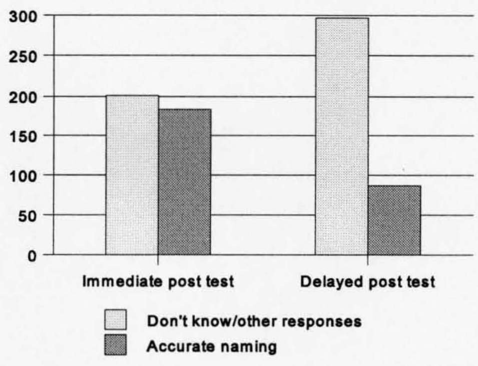
Scoring criteria for the naming task

Each child had to answer two questions. Each response was scored 1 for correct and 0 for incorrect. To be scored correct, the response had to be the accurate production of the target word. Any other response was scored as incorrect. Each child could get a score from 0 - 2. An error analysis was also carried out.

Analysis

If all children (192 participants) were correct on all target words (2 items), the maximum total score would be 384 responses for all the participants in each post test. Figure 5.1 below shows children's performance on the naming task for both post tests. As the figure[2] shows, more than half (183) of the children's responses were correct (accurate naming) in the immediate post test, while only one third (87) of the responses were correct during the delayed post test.

Figure 5.1 Children's performance on the naming task for both post tests

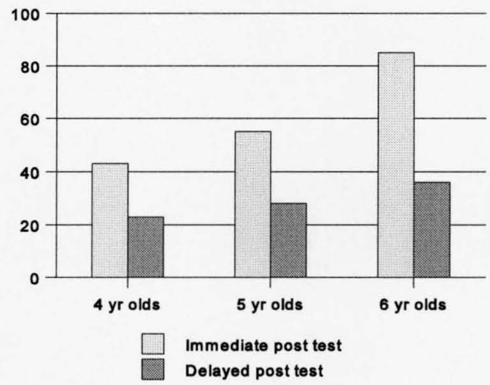


[2]Raw data were put in all the figures in order to be completely transparent for the results.

To what extent does children's performance on the naming task differ by age ?

If all children from each age group (64 participants) were correct on the two target words, the maximum total score would be 128 for each age group in each post test. Figure 5.2 below demonstrates children's performance on the naming task by age group in the immediate and delayed post test.

Figure 5.2 Total number of correct responses on the naming task by age for both tests



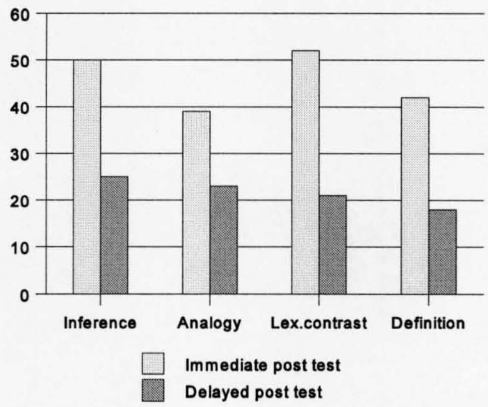
Significant correlations were found between children's age and their performance on the naming task during the immediate post test. The correlations were still significant during the Immediate post test, when children's vocabulary knowledge and memory were controlled for (see Table in Appendix 5.8 for correlations).

Children's responses were also analysed using two one way ANOVAs with age as the only factor and scores on the naming task as the dependent measure during the immediate and delayed post test. Significant differences were found during the immediate (Kruskal-Wallis 1-Way Anova: X^2= 24.3, df=2, p<.0000) but not the delayed post test. Post hoc analysis of the immediate post test revealed that the 6 year olds performed significantly better than the 4 year olds (Mann-Whitney: Z=4.8, p>.0000) and the 5 year olds (Mann-Whitney: Z=3.3, p<.005).

Furthermore, the same pattern was evident within each linguistic condition. Significant differences by age were found for the Inference group during the immediate (Kruskal-Wallis 1-Way Anova: X^2= 8.7, df=2, p<.05) and the delayed post test (Kruskal-Wallis 1-Way Anova: X^2= 7.6, df=2, p<.05). Post hoc analysis revealed that the 6 year olds performed significantly better than the 4 year olds for both post tests (Imme: Mann-Whitney: Z=2.9, p<.005; De: Z=2.8, p<.005). The same pattern was also found for the Lexical contrast group during the immediate post test (Kruskal-Wallis 1-Way Anova: X^2= 8.5, df=2, p<.05). Post hoc analysis revealed that the 6 year olds performed significantly better than the 4 year olds (Mann-Whitney: Z=2.7, p<.005). Significant differences were also found for the Definition group (Kruskal-Wallis 1-Way Anova: X^2= 7.4, df=2, p<.05). Post hoc analysis revealed that the 6 year olds performed significantly better than the 4 year olds. A trend for significance for the above pattern, was found for the Analogy group.

To what extent does children's performance in the naming task differ by linguistic condition?
If all children from each linguistic condition (48 participants) were correct on the two target words, the maximum total score would be 96 for each linguistic condition in each post test. Figure 5.3 demonstrates children's performance on the naming task by linguistic condition for both post tests. The following figure shows that during the immediate post test, the children from the Lexical contrast and Inference conditions performed better than the children from the Definition and Analogy conditions.

Figure 5.3 Total number of correct responses on the naming task by linguistic condition for both post tests



Children's responses were analysed using two analyses of variance (ANOVAs) with score in the naming task as the dependent factor and type of linguistic condition as the independent factor. During the immediate post test, the children from the Lexical contrast and Inference conditions, performed better than the children from the other conditions. Furthermore, during the delayed post test the children from the Inference and Analogy conditions performed better than the children from the Lexical contrast and Definition conditions. However, a trend for significance characterised the above findings.

Whether the same pattern was evident for each age group was also investigated. Each one of the age groups performed better in the Inference and Lexical contrast than the other conditions. However, the differences were not significant.

To what extent does children's success in the naming task change between the immediate and the delayed post test ?

Children performed better in the immediate (47.6%) than the delayed post test (22.6%). The differences were significant (Wilcoxon: Z=6.8, p<.0000). The same pattern was evident within each age group [4yrs, Wilcoxon: Z=3.03, p<.005; 5yrs, Wilcoxon: Z=3.5, p<.0005; 6 yrs: Z=4.9, p<.0000). Furthermore, the same pattern was found within each linguistic condition [Inference, Wilcoxon: 3.5, p<.0005; Analogy, Wilcoxon: Z=2.5, p<.05; Contrast: Z=3.9, p<.0005; Definition, Wilcoxon: Z=2.5, p<.005)

To what extent does children's performance on the naming task differ by their existing vocabulary?

There was a trend for the children with high existing vocabulary to perform better on the naming task than the children with low existing vocabulary for both post tests (see Table in the Appendix 5.9). The same pattern was found within each age group and within each linguistic condition. Significant differences were found for the Definition group during the delayed post test (Mann-Whitney: Z=2.09, p<.05).

To what extent does children's performance on the naming task differ by their phonological memory?

Children with high phonological memory performed better on the naming task than the children with low phonological memory for both post tests (see Table in Appendix 5.10). Significant differences were found during the immediate post test (Mann-Whitney: Z=2.7, p<.05). The same pattern was found within each age group, however, the differences were not significant. Furthermore, the same pattern was found within each linguistic condition. Significant differences were found during the immediate post test for the Inference condition (Mann-Whitney: Z=2.1, p<.05) and the Lexical contrast condition (Mann-Whitney: Z=2.7, p<.05).

Error analysis

An Error analysis was carried out to identify the different responses given on the naming task These are presented in the following table.

Table 5.7 Children's responses in the naming task

Responses	Description
Don't know	If they did not provide any answer
Irrelevant responses	If irrelevant responses were given e.g. *toy, kite, boat*
Phonological error	Non-accurate production of the target word, e.g. "*abo*" for abez and "*femer*" for feber
Basic level word	Use of a basic level word, e.g. *flute* for abez and *tent* for feber
Superordinate level word	Use of a superordinate word, e.g. *instrument* for abez and *house* for feber
Functional properties	Mention of functional properties, e.g. *something you play music with* for the abez and *for Indians to live* for the feber
Target word	Naming accurately the target word

The distribution of children's responses for both post tests is presented in Table 5.8. Children's performance for both target words together is presented since their performance did not differ by the target item.

Table 5.8 Children's responses in the naming task in the immediate and delayed post tests

Responses	Immediate post test		Delayed post test	
	%	**n**	**%**	**n**
Don't know	33.8	130	44.3	170
Irrelevant responses	1	4	2.6	10
Phonological error	1.6	6	6	23
Functional properties	2.3	9	5.7	22
Basic level word	10.7	41	15.4	59
Superordinate level word	2.9	11	3.4	13
Target word	47.6	183	22.6	87
N of responses		384		384

Successful performance was the more frequent response during the immediate post test as well as the most frequent response from the given responses in the delayed post test. Statistical analysis indicated that the children during the Immediate post test provided significantly more *"target word"* than "*don't know*" responses (Wilcoxon: $Z=2.5$, $p<.05$), while in the delayed post test they provided more *"don't know"* responses than *"target* *words"* (Delayed: Z=4.2, p<.0000). Also they provided more *"target words"* than *"irrelevant responses"* (Immediate: Wilcoxon: Z=9.6, p<.0000; Delayed: Z=4.8, p<.0000) *"making phonological errors"* (Immediate: Wilcoxon: Z=9.7, p<.0000; Delayed: Z=6.1, p<.0000) *"providing functional properties"* (Immediate: Wilcoxon: Z=9.5, p<.0000; Delayed: Z=5.1, p<.0000), *"using a basic level word"* (Immediate: Wilcoxon: Z=7.7, p<.0000; Delayed: Z=2.1, p<.0000) or *"superordinate level"* word (Immediate: Wilcoxon: Z=9.4, p<.0000; Delayed: Z=6.04, p<.0000).

Use of a *"basic level word"* was the more frequent error after the *"don't know"* responses across testing. Statistical analysis indicated that the children provided significantly more a *"basic level word"* than *"irrelevant responses"* (Immediate: Wilcoxon: Z=4.3, p<.0000; Delayed: Z=3.5, p<.0005) *"phonological errors"* (Immediate: Wilcoxon: Z=4.6, p<.0000; Del: Z=5.04, p<.0000) *"functional properties"*(Immediate: Wilcoxon: Z=4.06, p<.0000; Delayed: Z=3.6, p<.0000) *"a superordinate level word"* (Immediate: Wilcoxon: Z=3.6, p<.0005; Delayed: Z=4.6, p<.0000).

Whether the same pattern was evident within each age group and each linguistic condition was also investigated. The distribution of responses separately by age and linguistic condition is presented in Appendices 5.11 and 5.12. The same pattern was evident for both types of analyses.

Key findings from the naming task

To what extent does children's performance on the naming task differ by age ?

- During the immediate post test the 6 year olds performed significantly better than the two youngest age groups. No significant differences were found during the delayed post test.

- Significant differences by age were found for the Inference condition for both post tests. Particularly, the 6 year olds performed significantly better than the 4 year olds. The same pattern was found for the Lexical contrast and Definition conditions during the immediate post test. No significant differences were found for the Analogy condition.

To what extent does children's performance on the naming task differ by linguistic condition?

- During the immediate post test, the children in the Lexical contrast and Inference conditions performed better on the naming task, while in the delayed post test children in the Inference and Analogy conditions performed better on the naming task than the children from the Lexical contrast and Definition conditions. However, the differences were not significant. The same pattern was found for each age group separately.

To what extent does children's success on the naming task change between the immediate and delayed post test?

- Children performed significantly better during the immediate than the delayed post test. The same pattern was evident within each age group and linguistic condition.

To what extent does children's performance on the naming task differ by their existing vocabulary?

- There was a trend for the children with high existing vocabulary to perform better than the children with low existing vocabulary for both post tests.
- The same pattern was found within each age group and within each linguistic condition. Significant differences were found for the Definition group during the delayed post test.

To what extent does children's performance on the naming task differ by their phonological memory?

- Children with high phonological memory performed better on the naming task than the children with low phonological memory for both post tests. Significant differences were found for the immediate post test.
- The same pattern was found within each age group, however, the differences were not significant.
- The same pattern was found within each linguistic condition. Significant differences were found during the immediate post test for the Inference and Contrast group.

Error analysis

- The children gave different responses in the naming task. These were classified as irrelevant, or provision of a phonological error, mention of functional properties or use of a basic level, a superordinate level word, the accurate production of the target word.

- From the responses given (except from the "*don't know*" responses), successful performance was significantly the most frequent for both post tests. Use of a "*basic level*" word was also the more frequent error after the "*don't know*" responses for both post tests. The same pattern was evident within each age group and each linguistic condition.

Concluding remarks for the naming task

- The analysis of the naming task demonstrated that the older age-group children performed better than the younger ones. The same pattern was found within the Inference, Lexical contrast and Definition condition. Moreover, differences by linguistic condition were also found in children's performance on the naming task. There was a trend for the children from the Inference group to perform better than the other children from the other groups during the immediate post test. Additionally, there was a trend for the children in the Lexical contrast condition to perform better than the children in the other conditions during the delayed post test. Children performed better during the immediate than the delayed post test. Last, a trend was found for the children with high existing vocabulary to perform better than children with low existing vocabulary. Also, the children with high phonological memory performed better than children with low phonological memory.

5.4.2.2 The Comprehension measures

5.4.2.2.1 Multiple choice task

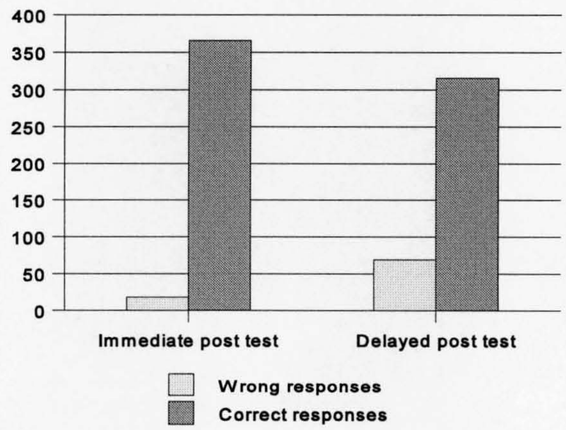
Scoring criteria for the multiple choice task

Each child had to answer two questions. Each response was scored 1 for correct and 0 for incorrect. To be scored correct, the response had to be accurate pointing to the target word on the plate. Any other response (pointing) was scored as incorrect. Each child could get a score from 0- 2. An error analysis was also carried out.

Analysis

If all children (192 participants) were correct on all target words (2 items) the maximum total score would be 384 for all the participants in each post test. As the figure 5.4 below shows, children's successful performance reached the 95.3% during the immediate post test and 82% during the delayed post test. The multiple choice task was an easy task for the children.

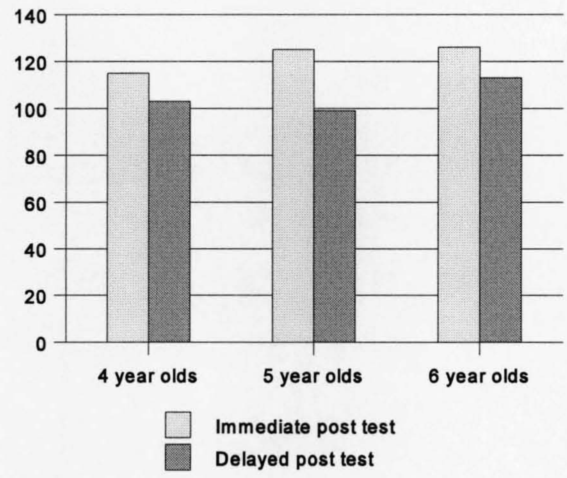
Figure 5.4 Children's performance on the multiple choice task for both tests



To what extent does children's performance on the multiple choice task differ by age ?

If all children from each age group (64 participants) were correct on the two target words, the maximum total score would be 128 for each age group and each post test. Figure 5.5 illustrates children's performance on the multiple choice task by age for both post tests. As the figure shows the older children performed better than the younger ones. Significant correlations were found between children's age and their performance on the multiple choice task for both post tests. The same pattern was evident, even when children's vocabulary and memory scores were controlled for (see Table in Appendix 5.13 for correlations).

Figure 5.5 Total number of correct responses in the multiple choice task by age for both post tests



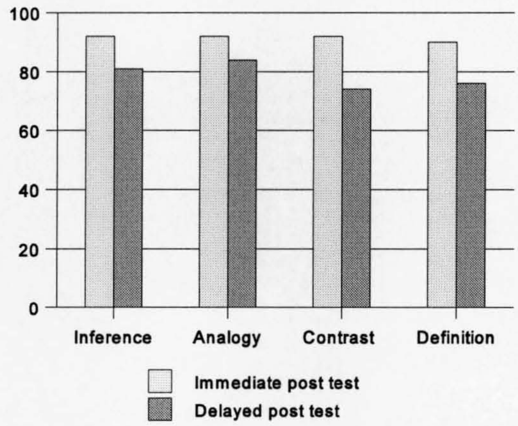
In order to further investigate whether the differences were statistically significant, two one Way ANOVAs were carried out, both for the immediate and the delayed post test. Age was the independent factor and score on the multiple choice task was the dependent factor. Significant differences were found for the immediate post test (Kruskal-Wallis, 1 Way ANOVA: X^2= 11.7, df=2, p<.005). Post hoc analysis of the immediate post test revealed that the 6 year olds performed significantly better than the 4 year olds (Mann-Whitney: Z=2.8 p<.005). Also, the 5 year olds performed significantly better than the 4 year olds (Mann-Whitney: Z=2.4 p<.05). Post hoc analysis of the delayed post test revealed that the 6 year olds performed significantly better than the 5 year olds (Mann-Whitney: Z=2.03, p<.05).

Whether the same pattern was evident within each linguistic condition, for both post tests was also investigated. No significant differences were found except for the Lexical Contrast condition for both post tests (Immediate post test: Kruskal-Wallis, 1 Way ANOVA: X^2= 8.5, df=2, p<.05; Delayed post test: Kruskal-Wallis, 1 Way ANOVA: X^2= 6.5, df=2, p<.05). Post hoc analysis revealed that the 6 year-olds performed significantly better than the 4 year olds (Mann-Whitney: Z=2.1, p<.05). Also, the 5 year-olds performed significantly better than the 4 year olds (Mann-Whitney: Z=2.1, p<.05) during the immediate post test. During the Delayed post test the 6 year olds performed significantly better than the 5 year-olds (Mann-Whitney: Z=2.5, p<.05). No significant differences were found for the other linguistic conditions.

To what extent does children's performance on the multiple choice task differ by linguistic condition?

If all children from each linguistic condition (48 participants) were correct on the two target words, the maximum total score would be 96 for each linguistic condition in each post test. Figure 5.6 below shows children's performance on the multiple choice task by linguistic condition for both post tests. As the figure illustrates all the children from the different linguistic conditions performed at the same level (ceiling effect). Statistical analysis revealed no significant differences. Linguistic condition differences within each age group were also investigated. The same pattern was found within each age group as before.

Figure 5.6 Total number of correct responses in the multiple choice task by linguistic condition for both post tests



To what extent does children's success in the multiple choice task change between the immediate and delayed post test ?

During the immediate post test there were 95.3% correct responses while in the delayed post test 82% correct responses. Statistical comparison between the two post tests revealed that children performed significantly better during the immediate than the delayed post test (Wilcoxon: $Z=4.8$, $p<.0000$). Comparison of children's performance between the two post tests within each age group revealed the same pattern for the 4 year-olds (Wilcoxon: $Z=2.1$, $p<.05$) the 5 year-olds (Wilcoxon: $Z=3.5$, $p<.0005$) and the 6 year-olds (Wilcoxon: $Z=2.5$, $p<.05$).

Comparison of children's performance between the two post tests within each linguistic condition revealed the same pattern for the Inference (Wilcoxon, $Z=2.5$, $p<.05$), Analogy

(Wilcoxon, Z=2.4, p<.05) and Lexical contrast condition (Wilcoxon: Z= 2.9, p<.005). There was a trend for significance for the Definition condition.

To what extent does children's performance on the multiple choice task differ by their existing vocabulary?

The children with high existing vocabulary performed better than the children with low existing vocabulary for both post tests (see Table in the Appendix 5.9). However, the differences were not significant in neither of the post tests. The same pattern was found within each age group but the differences were not significant, while the differences for the youngest age group tended towards significance for both post tests. Furthermore, whether the same pattern was evident within each linguistic condition was also investigated, however no significant differences were found.

To what extent does children's performance on the Multiple choice task differ by their phonological memory?

The children with high phonological memory performed better than the children with low phonological memory in both post tests (see Table in Appendix 5.10). No significant differences were found during the immediate post test, while the differences tended towards significance during the delayed post test. The same pattern was found within each age group, however the differences were not significant (. Whether the same pattern was evident within each linguistic condition was also investigated. No significant differences were found for any of the conditions for both post tests, except for the Definition (Mann-Whitney: Z=2.2, p<.05) and Lexical contrast condition (Mann-Whitney: Z=1.9, p<.05) during the delayed post test. In both conditions, the children with high phonological memory performed significantly better than the children with low phonological memory.

Key findings from the multiple choice task

To what extent does children's performance on the multiple choice task differ by age ?

- The older children performed better than the younger ones. Significant correlations were found between age and performance on the multiple choice task. The pattern was the same even when children's vocabulary and memory scores were controlled for.

- Significant differences by age were found for the immediate post test. Post hoc analysis of the immediate post test revealed that the 5- and the 6- year-olds performed significantly better than the 4 year-olds. Analysis of the delayed post test revealed that the 6 year-olds performed significantly better than the 5 year-olds.

- The same pattern was evident within all the linguistic conditions, however, significant differences were found only for the Lexical contrast group for both post tests. Post hoc analysis revealed that the 5- and 6- year-olds performed significantly better than the 4 year-olds in the immediate post test. During the delayed post test the 6 year-olds performed significantly better than the 5 year-olds. No significant differences between the age groups were found for the other linguistic conditions.

To what extent does children's performance on the multiple choice task differ by linguistic condition?

- No significant differences were found for any of the post tests. Linguistic condition differences within each age group were also investigated, however no significant differences were found.

To what extent does children's success on the multiple choice task change between the immediate and delayed post test ?

- Children performed significantly better during the immediate than the delayed post test. Comparison of children's performance between the two post tests within each age group revealed the same pattern for all the age groups.

- Comparison of children's performance between the two post tests within each linguistic condition revealed the same pattern for the Inference, Analogy and Lexical contrast condition. There was a trend for significance for the Definition condition.

To what extent does children's performance on the multiple choice task differ by their existing vocabulary ?

- Children with high existing vocabulary performed better than the children with low existing vocabulary. However, the differences were not significant.
- The same pattern was found within each age group and each linguistic condition however, the differences were not significant.

To what extent does children's performance on the multiple choice task differ by their phonological memory?

- Children with high phonological memory performed better than the children with low phonological memory. Significant differences were found during the delayed post test.
- The same pattern was found within each age group. However the differences were not significant. Furthermore, the same pattern was evident within each linguistic condition. Significant differences were found for the Definition and Lexical contrast condition during the delayed post test.

Concluding remarks from the multiple choice task

- Age group differences were found with the 5- and 6- year-olds performing better than the 4 year-olds. The same pattern was evident within each linguistic condition. Significant differences were found for the Lexical contrast group. Overall, children's performance on the multiple choice task did not differ by linguistic condition. Children also performed better in the immediate than the delayed post test. Last, there was a trend for the children with high existing vocabulary to perform better than the children with low existing vocabulary. Children with high phonological memory performed better than children with low phonological memory.

5.4.2.2.2 Inference task

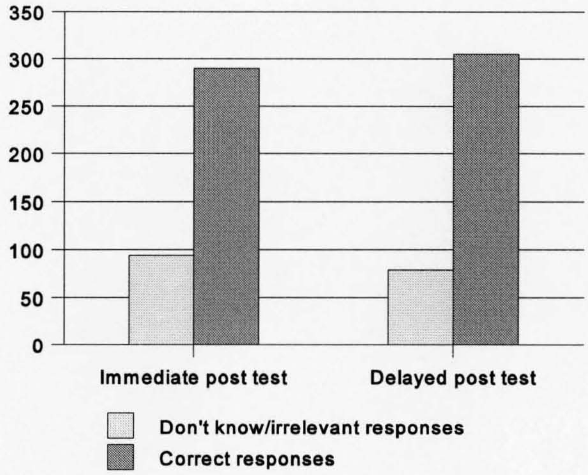
Scoring criteria for the inference task

In each trial the child had to answer two questions for the puppet. Each response was scored 1 for correct and 0 for incorrect. To be correct, the response had to be an appropriate answer to the inference task, while incorrect was scored if the child provided an inappropriate answer. All responses that provided correct information[1] to the question were counted as appropriate answers to the inference task ("What do we do with the x?"). Each child could get a score from 0-2.

Analysis

If all children were correct on the two target words, the maximum total score would be 384 for all the participants in each post test. Figure 5.7 below illustrates children's performance on the inference task for both post tests. It can be seen that during the immediate post test children provided 290 correct responses, while during the delayed post test they provided 305 correct responses. The inference task was quite an easy task for them.

Figure 5.7 Children's performance on the inference task for both post tests



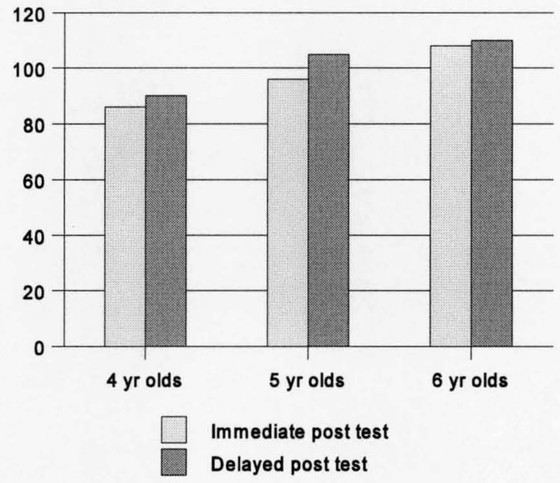
To what extent does children's performance on the inference task differ by age ?

If all children from each age group were correct on the two target words, the maximum total score would be 128 for each age group in each post test. Figure 5.8 demonstrates children's

[1]For the present task appropriate answers were those responses which focused on the action of the object and the functional properties of the object (see Error analysis)

performance on the inference task by age group for both post tests. As the figure below shows there were age differences on children's performance.

Figure 5.8 Total number of correct responses in the inference task by age for both post tests



Significant correlations were found between children's age and their performance on the inference task across testing. The same pattern was also found when vocabulary and memory scores were controlled for (see Appendix 5.14 for correlations).

Two one way ANOVAs were used in order to investigate whether the differences were significant. Score in the inference task was the dependent factor, while age was the independent factor. Significant differences were found both for the immediate (Kruskal-Wallis, 1 Way ANOVA: X^2= 10.9, df=2, p<.005) and the Delayed post test (Kruskal-Wallis, 1 Way ANOVA: X^2= 11.2, df=2, p<.005).

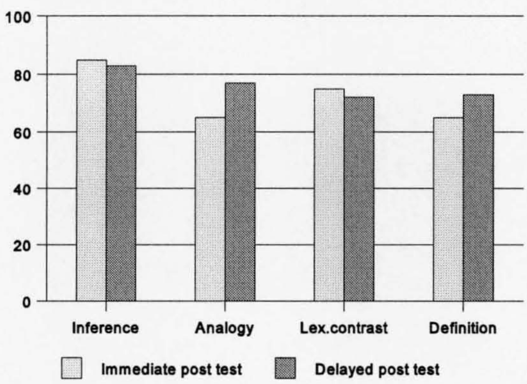
Post hoc analysis for the immediate post test revealed that the older children performed better than the younger ones. The 6 year-olds, particularly performed significantly better than the 4 year-olds (Mann-Whitney: Z=3.3, p<.005) and the 6 year-olds tended to perform better than the 5 year-olds. No significant differences were found between the 4- and 5 year-olds. Post hoc analysis for the delayed post test revealed that the 5 year-olds performed significantly better than the 4 year-olds (Mann-Whitney: Z=2.1, p<.05). Similarly, the 6 year-olds performed significantly better than the 4 year-olds (Mann-Whitney: Z=3.2, p<.005). No significant differences were found between the 5- and the 6 year-olds.

Whether the same pattern was evident within each linguistic condition for both tests was also investigated. The same pattern was found within each linguistic condition for each post test. Significant differences were found for the Definition condition during the delayed post test (Kruskal-Wallis, 1 Way ANOVA: $X^2= 6.3$, df=2, $p<.05$). Post hoc analysis revealed that the 6 year-olds performed significantly better than the 4 year-olds in the immediate (Mann-Whitney:Z=2.1, $p<.05$) and the delayed post tests (Mann-Whitney: Z=2.1, $p<.05$). Furthermore, the 5 year-olds performed significantly better than the 4 year-olds in the delayed post test (Mann-Whitney: Z=2.00, $p<.05$).

To what extent does children's performance on the inference task differ by linguistic condition?

If all children from each linguistic condition (48 participants) were correct on the two target words, the maximum total score would be 96 for each linguistic condition and each post test. Figure 5.9 below illustrates children's performance on the inference task by linguistic condition for both post tests. As the figure shows, during the immediate post test, children in the Inference and Lexical contrast conditions performed better on the inference task than children in the other conditions. During the Delayed post test children in the inference and Analogy condition performed better than children in the other conditions.

Figure 5.9 Total number of correct responses in the inference task by linguistic condition for both post tests



Two one way ANOVAs were carried out with score in the inference task as the dependent variable and linguistic condition as the dependent factor. Significant differences were found during the immediate post test (Kruskal-Wallis, 1 Way ANOVA: $X^2= 13.9$, df=3, $p<.005$). Post hoc analysis demonstrated that during the immediate post test, the children in the

Inference condition performed significantly better on the inference task than the children in the Definition (Mann-Whitney: Z=3.1, p<.005) and Analogy conditions (Mann-Whitney: Z=3.3, p<.005). Furthermore, there was a trend for the children in the Inference condition to perform better than the children in the Lexical contrast condition. No significant differences between the other groups were found. During the delayed post test the same pattern as before was found, however the differences were not significant. Linguistic condition differences within each age group were also investigated. The same pattern was found within each age group, however the differences were not significant.

To what extent does children's success on the Inference task change between the immediate and delayed post test ?

There was a trend for the children to perform better during the delayed than the immediate post test. Comparison of children's performance between the two post tests within each age group revealed the same pattern. However, the differences were not significant. Lastly, whether the same pattern was evident within each linguistic condition was investigated. The analysis revealed the same pattern. Significant differences were found in the Definition (Wilcoxon: Z=2.2, p<.05) and Analogy condition (Wilcoxon: Z=2.1, p<.05).

To what extent does children's performance on the inference task differ by their existing vocabulary?

Children with high existing vocabulary performed better than children with low existing vocabulary knowledge for both post tests (see Table in Appendix 5.9). The differences tended towards significance during the immediate post test, while significant differences were found during the delayed post test (Mann-Whitney: Z=3.2, p<.005).

Whether the same pattern was evident within each age group was also investigated. The same pattern was found within each age group. Significant differences were found for the 4 year- olds during the delayed post test (Mann-Whitney: Z=2.2, p<.05), the 5 year-olds during the immediate post test (Mann-Whitney, Z=2.3, p<.05) and the 6 year-olds during the delayed post test (Mann-Whitney: Z=3.05, p<.005). Furthermore, whether the same pattern was evident within each linguistic condition was also investigated. The same pattern was found within each linguistic condition. Significant differences were found for the Lexical contrast condition during the delayed post test (Mann-Whitney: Z=2.08, p<.05).

To what extent does children's performance on the inference task differ by their phonological memory?

The children with high phonological memory performed better than the children with low phonological memory for both post tests (see Table in Appendix 5.10). A trend for significance was found during the immediate post test, while significant differences were found during the delayed post test (Mann-Whitney: Z=2.3, p<.05).

It was also investigated whether the same pattern was evident within each age group. The same pattern was found within each age group. Significant differences were found for the 5 year-olds during the immediate post test (Mann-Whitney, Z=2.3, p<.05).Furthermore, whether the same pattern was evident within each linguistic condition was investigated. The same pattern was found within each linguistic condition. Significant differences were found for the Lexical contrast condition during the delayed post test (Mann-Whitney: Z=2.1, p<.05).

Error analysis

An Error analysis was carried out to identify the different types of responses given in the inference task. These are presented in table 5.6 below.

Table 5.9 Types of responses given in the inference task

Responses	Description
Don't know	If no responses were given by the children
Irrelevant responses	If they gave irrelevant responses
Action to the object	Mention of how someone acts on the target items (e.g." *we blow it*" for the abez and "*we can make it*" for the feber
Functional properties	Mention of the functional properties of the items ("*we play music with it*" for the abez and "*people can leave in there*" for the feber).

The distribution of children's responses for both words and both post tests is presented in Table 5.10. Children's performance for both target words together is presented since their performance did not differ significantly by target item.

Table 5.10 Children's responses in the inference task for both post tests

	Immediate post test		Delayed post test	
	%	n	%	n
Don't know	19.5	75	14.8	57
Irrelevant	4.9	19	5.7	22
Action on the object	43.2	166	41.7	160
Functional properties	32.3	124	37.8	145
N of responses		384		384

Responses focusing on the "*action of the object*" and the "*functional properties*" of the target items (successful performance) were the more frequent for both post tests. Particularly, the children provided significantly more "*action to the object*" responses than "*don't know*" (immediate: Wilcoxon: Z=5.1, p<.0000; delayed: Wilcoxon: Z=5.8, p<.0000), "*irrelevant*" (immediate:Wilcoxon: Z=9.3, p<.0000; delayed: Wilcoxon: Z=9.3, p<.0000) and "*functional properties*" responses (immediate: Wilcoxon: Z=2,4, p<.05). Furthermore, children provided significantly more "*functional properties*" responses than "*don't know*" (immediate: Wilcoxon: Z=2.9, p<.005; delayed: Wilcoxon: Z=4.9, p<.0000) and "*irrelevant*" responses (immediate: Wilcoxon: Z=7.4, p<.0000; delayed: Wilcoxon: Z=7.7, p<.0000).

The distribution of responses separately by age and linguistic condition is presented in Appendices 5.15 and 5.16.The same pattern was evident for both types of analyses. Furthermore, the analysis by age revealed that the answers of the 4 year-olds remained the same during the delayed post test (Action on the object responses: immediate = 44.5% and delayed = 45.3%; Functional properties: immediate = 22.6% and delayed = 25%). The 5 year olds "*action on the object*" responses decreased during the delayed post test (immediate = 46% and delayed = 42.2%), while the "*functional properties*" responses increased during the delayed post test (immediate: 28.9% and delayed=39.8%).The increase of the "*functional properties*" was significant (Wilcoxon: Z=2.3, p<.05). The same pattern was evident for the 6 year-olds who also provided more responses focusing on the "*action to the object*" and on "*functional properties*" than the 4- and 5 year-olds.

Key findings from the inference task

To what extent does children's performance on the inference task differ by age ?

- Significant correlations were found between children's age and their performance on the inference task both with and without controlling for their vocabulary and memory for both post tests.

- The older children performed better than the younger ones. Significant differences were found for both post tests. Post hoc analysis for the immediate post test revealed that the 6 year-olds performed significantly better than the 4 year-olds. There was also a trend for 6 year-olds to perform better than the 5 year-olds. No significant differences were found between the 4- and 5- year olds. Post hoc analysis of the delayed post test revealed the same pattern. No significant differences were found between the 5 and the 6 year-olds again.

- The older children performed better than the younger ones within each linguistic condition for both post tests. The differences were significant for the children from Definition condition during the delayed post test.

To what extent does children's performance on the inference task differ by linguistic condition?

- Significant differences by linguistic condition were found during the immediate post test. Post hoc analyses demonstrated that during the immediate post test children in the Inference condition performed significantly better on the inference task than the children from the Definition and Analogy condition. Furthermore, there was a trend for the children in the Inference condition to perform better than the children in the Lexical contrast condition. During the delayed post test the same pattern as before was found, however the differences were not significant. No significant differences between the other conditions were found.

- Linguistic condition differences within each age group were also investigated. The same pattern as before was found within each age group, however the differences were not significant.

To what extent does children's success in the inference task change between the immediate and the delayed post test ?

- Children tended to perform better during the delayed than the immediate post test. Comparison of children's performance between the two post tests within each age group revealed the same pattern however the differences were not significant.

- The same pattern as above was also found within each linguistic condition. Significant differences between the two post tests were found for the Definition and Analogy conditions.

To what extent does children's performance on the inference task differ by their existing vocabulary?

- Children with high existing vocabulary performed better than children with low existing vocabulary across testing. The differences tended towards significance during the immediate post test, while significant differences were found in the delayed post test.

- The same pattern was found within each age group. Significant differences were found for the 4 year-olds during the delayed post test, the 5 year-olds during the immediate post test and the 6 year-olds during the delayed post test.

- The same pattern was also found within each linguistic condition. Significant differences were found for the Lexical contrast condition during the Delayed post test.

To what extent does children's performance on the inference task differ by their phonological memory?

- Children with high phonological memory performed better than children with low phonological memory for both post tests. The differences tended towards significance during the immediate post test, while significant differences were found during the delayed post test.

- The same pattern was found within each age group. Significant differences were found for the 5 year-olds during the immediate post test. The same pattern was found within each linguistic condition. Significant differences were found for the Lexical contrast condition during the delayed post test.

Error analysis

- Children's given responses to the inference task mainly focused on the *"action to the object"* and *"functional properties"* of the target item. Responses focusing on the above categories were the more frequent for both post tests.

- The same pattern was found within each age group and linguistic condition. The analysis by age revealed that the responses of the 4 year-olds remained the same during the delayed post test. The 5 year-olds *"action on the object"* responses decreased during the delayed post test, while the *"functional properties"* responses increased during the delayed post test. The increase of the *"functional properties"* responses was significant. The same pattern was evident for the 6 year-olds; they also provided more responses focusing on the *"action to the object"* and on the *"functional properties"* than the 4- and 5 year-olds.

Concluding remarks for the inference task

- The analysis of the inference task illustrated that the 6 year-olds performed better than the 4- and 5 year-olds. The same pattern was evident within each linguistic condition. Differences by linguistic condition were also found. Children in the Inference condition performed better than the children in the other conditions for both post tests. The same pattern was found within each age group. It was also found that the children performed better in the delayed than the immediate post test. That pattern was evident within each age group and linguistic condition. A trend was also found for the children with high existing vocabulary to perform better than the children with low existing vocabulary. Furthermore, children with high phonological memory performed better than children with low phonological memory. The previous findings were also evident within each age group and linguistic condition.

5.4.2.2.3 Definition task

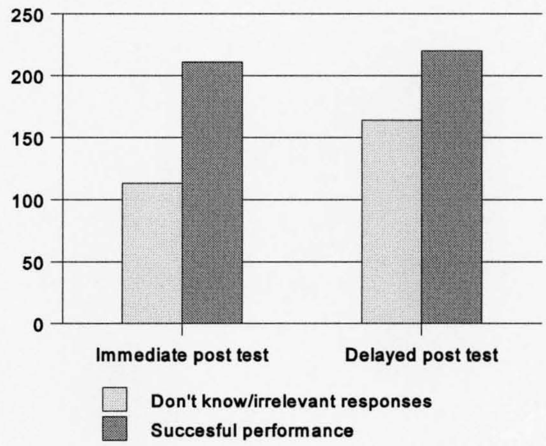
Scoring criteria for the Definition task

Each child had to answer two questions which were to provide definitions for the two target words. To be scored correct, the response had to be provision of an appropriate definition and incorrect the provision of an incorrect definition. For the present experiment a definition was appropriate if it included any of the following information: (1) descriptive; (2) contextual; (3) functional; (4) semantic (the different types of appropriate information are described in Table 5.11). Each child could get a score from 0- 2.

Analysis

If all children were correct on the two target words, the maximum total score would be 384 for all the participants in each post test. As the Figure 5.10 below shows, children's successful performance reached the 54.9% during the immediate post test and 57.3% during the delayed post test.

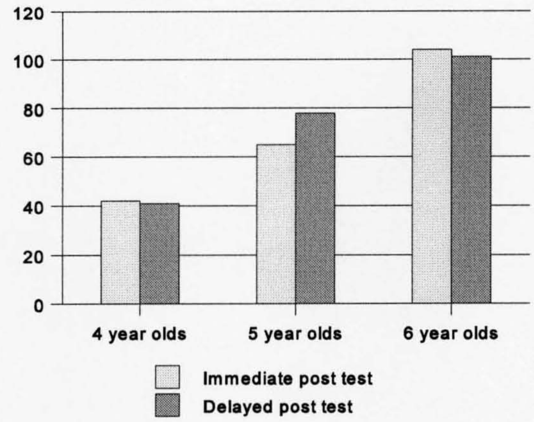
Figure 5.10 Children's performance on the definition task for both post tests



To what extent does children's performance on the definition task differ by age ?

If all children from each age group were correct on the two target words, the minimum total score would be 128 for each age group in each post test. Figure 5.11 demonstrates children's performance on the definition task by age group for both post tests. Significant correlations were found between children's age and their performance on the definition task for both post tests. The same pattern was found when children's vocabulary and memory were controlled for (see Table in Appendix 5.17).

Figure 5.11 Total number of correct responses in the definition task by age group for both post tests



Two one way ANOVAs with age as the independent factor and scores on the definition task as the dependent measure for each post test were carried out. Significant differences were found both for the immediate (Kruskal-Wallis 1-way ANOVA: $X^2=47.9$, df=2, $p<.0000$) and the delayed post test (Kruskal-Wallis 1-way ANOVA: $X^2=40.3$, df=2, $p<.0000$). Post hoc analysis revealed that the 5 year-olds performed significantly better than the 4 year-olds in the immediate (Mann-Whitney: Z=2.5, $p<.05$) and the delayed post test (Mann-Whitney: Z=3.9, $p<.0005$). The 6 year-olds also performed significantly better than the 4 year-olds in the immediate (Mann-Whitney: Z=6.8, $p<.0000$) and the delayed post test (Mann-Whitney: Z=6.09, $p<.0000$). Furthermore, the 6 year-olds performed significantly better than the 5 year-olds during the immediate (Mann-Whitney: Z=4.4, $p<.0000$) and the delayed post test (Mann-Whitney: Z=2.9, $p<.005$).

Whether the same pattern was evident within each linguistic condition was also investigated. Significant differences were found within each linguistic condition [Inference: (immediate: Kruskal-Wallis 1-way ANOVA: $X^2=8.5$, df=2, $p<.05$) and (delayed: Kruskal-Wallis 1-way ANOVA: $X^2=20.5$, df=2, $p<.0000$); Definition (immediate: Kruskal-Wallis 1-way ANOVA: $X^2=23.7$, df=2, $p<.0000$); and (delayed: Kruskal-Wallis 1-way ANOVA: $X^2=12.3$, df=2, $p<.005$); Analogy (immediate: Kruskal-Wallis 1-way ANOVA: $X^2=7.9$, df=2, $p<.05$), (delayed: Kruskal-Wallis 1-way ANOVA: $X^2=9.3$, df=2, $p<.05$);Lexical contrast: (immediate: Kruskal-Wallis 1-way ANOVA: $X^2=10.9$, df=2, $p<.005$)].

Post hoc analyses of children's responses from the Inference condition revealed that the 6 year-olds performed significantly better than the 4 year-olds [immediate: Mann-Whitney: $Z=2.8$, $p<.005$); delayed post test (Mann-Whitney: $Z= 4.2$, $p<.05$)] and the 5 year-olds [immediate: Mann-Whitney: $Z=2.02$, $p<.05$); delayed post test (Mann-Whitney: $Z= 2.7$, $p<.005$)]. Furthermore, the 5 year-olds performed significantly better than the 4 year-olds during the delayed post test (Mann-Whitney: $Z= 2.6$, $p<.05$).

Post hoc analyses of children's responses from the Definition condition indicated that the 6-year olds performed significantly better than the 4 year-olds [immediate: Mann-Whitney: $Z=4.5$, $p<.0000$); delayed post test (Mann-Whitney: $Z= 3.2$, $p<.005$)] and the 5 year-olds during the immediate post test: (Mann-Whitney: $Z=3.2$, $p<.005$). Furthermore, the 5 year-olds performed significantly better than the 4 year-olds [immediate: Mann-Whitney: $Z=2.4$, $p<.05$); delayed post test (Mann-Whitney: $Z= 2.6$, $p<.05$)].

Post hoc analyses of children's responses from the Analogy condition demonstrated that the 6 year-olds performed significantly better than the 4 year-olds (immediate: Mann-Whitney: $Z=2.8$, $p<.005$; delayed: Mann-Whitney: $Z=2.8$, $p<.005$).The 5 year-olds performed significantly better than the 4 year-olds during the delayed post test (Mann-Whitney: $Z= 2.01$, $p<.05$). No significant differences were found between the 6- and the 5 year-olds.

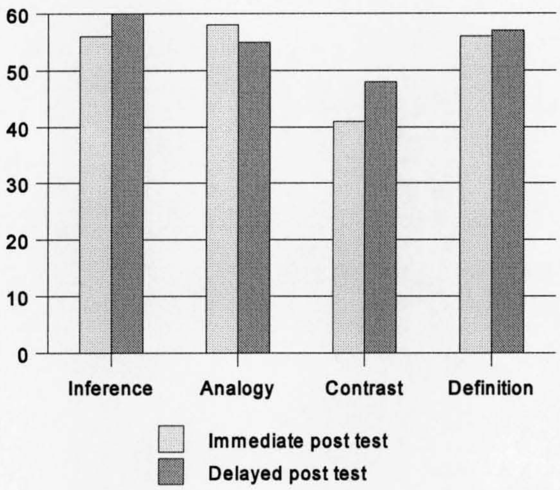
Post hoc analyses of children's responses from the Lexical contrast condition indicated that the 6 year-olds performed significantly better than the 4 year olds (Mann-Whitney: $Z= 3.1$, $p<.005$) and the 5 year-olds (Mann-Whitney: $Z= 2.3$, $p<.05$) during the immediate post test. No significant differences were found between the 4- and the 5 year-olds.

To what extent does children's performance on the definition task differ by linguistic condition?

If all children from each linguistic condition were correct on the two target words, the maximum total score would be 96 for each linguistic condition in each post test. Figure 5.12 below shows children's performance on the definition task by linguistic condition for both post tests. The statistical analysis of the immediate post test revealed that there was a trend for the children in the Inference and Definition conditions to perform better on the definition task than the children in the Lexical contrast condition. Furthermore, the children in the

Analogy condition performed significantly better than the children in the Lexical contrast condition (Mann-Whitney, Z=2.09, p<.05). No significant differences were found during the delayed post test.

Figure 5.12 Total number of correct responses in the definition task by linguistic condition for both post tests



Linguistic condition differences within each age group were also investigated. The same pattern was found within each age group as before. However, post hoc analysis of the 4 year-olds responses demonstrated that children in the Analogy condition performed significantly better than children in the Lexical contrast condition during the delayed post test (Mann-Whitney: Z=2.00, p<.05). Furthermore, post hoc analysis of the 6 year-olds responses revealed a trend for the children in the Definition condition to perform better than the children in the Analogy and Lexical contrast conditions during the immediate post test. Lastly, children in the Inference condition performed significantly better than children in the Definition (Mann-Whitney: Z=1.9, p<.05) and Lexical contrast conditions (Mann-Whitney: Z=2.3, p<.05) during the delayed post test.

To what extent does children's success on the definition task change between the immediate and delayed post test ?

During the immediate post test the children provided 54.9% appropriate definitions while in the delayed post test they provided 57.3 % appropriate definitions. Statistical comparison between the two post tests revealed no significant differences. Comparison of children's performance between the two post tests within each age group revealed the same pattern.

Comparison of children's performance between the two post tests within each linguistic condition revealed the same pattern.

To what extent does children's performance on the definition task differ by their existing vocabulary?

No significant differences were found in children's performance on the definition task by their existing vocabulary (see Table in Appendix 5.9) and linguistic condition.

To what extent does children's performance on the definition task differ by their phonological memory?

Children with high phonological memory performed significantly better than children with low phonological memory during the Immediate post test (Mann-Whitney: $Z=2.2$, $p<.05$) (see Table in Appendix 5.10). A trend for significance was found during the delayed post test. The same pattern was found within each age group and linguistic condition. Significant differences were found for the Lexical contrast condition (Mann-Whitney: $Z=1.8$, $p<.05$) in the immediate post test.

Error Analysis

An Error analysis was carried out to identify the different types of properties mentioned in children's definitions. These are presented in Table 5.11 below.

Table 5.11 Properties mentioned in children's definitions

Properties	Description
Don't know	If no attempt was made by the child to define the word
Irrelevant responses	When the child made an attempt to define the object but this was unsuccessful, e.g. "Make bubbles" for the abez.
Perceptual properties	Mention of perceptual properties e.g., "it is long and brown for the abez"
Functional properties	Mention of functional properties e.g. "you play a song" for the abez and "someone sleeps in it, Indians go in it" for the feber
Basic level word	Use of a basic level word from the same category. e.g. " a flute, a recorder, " for the abez and " a tent, a camp" for the feber
Superordinate level word	Use of a superordinate level word, e.g. "musical instrument" for the abez and "house" for the feber

The distribution of children's responses for both post tests is presented in Table 5.12. Results from both target words are presented together, since children's performance on the definition task did not differ by target item.

Table 5.12 Children's responses in the definition task for both post tests

Responses	Immediate post test		Delayed post test	
	%	n	%	n
Don't know	39.3	151	36.4	140
Irrelevant responses	5.7	22	6.2	24
Perceptual properties	2.3	9	1.6	6
Functional properties	15.1	58	20.3	78
Semantic properties[1]	37.5	144	35.4	136
N of responses	384		384	

From the responses given, "*semantic properties*" (use of a basic and superordinate level word) and "*functional properties*" were the most frequent types of responses in the definition task for both post tests. Statistical comparison among the number of properties mentioned revealed that all the children provided less "*perceptual*" than "*functional*" (immediate: Wilcoxon: Z=5.07, p<.0000; delayed: Wilcoxon: Z=6.1, p<.0000) and "*semantic*" properties (immediate: Wilcoxon: Z=8.2, p<.0000; delayed: Wilcoxon: Z=7.9, p<.0000) for both post tests. Furthermore, the children provided significantly more "*semantic*" than "*functional*" properties for both post tests (immediate: Z=5.05, p<.0000; delayed: Z=3.3, p<.005).

Whether the same pattern was evident within each age group and linguistic condition was also investigated. The distribution of responses separately by age and linguistic condition is presented in Appendices 5.18 and 5.19 The same pattern was evident within each age group. The older the children are, the more "*semantic*" properties they use in their definitions (see Appendix 5.18). The differences were significant for the immediate (Kruskal-Wallis, 1-Way ANOVA: X^2= 41.3, df=2, p<.0000) and the delayed post test (Kruskal-Wallis, 1-Way ANOVA: X^2= 22.6, df=2, p<.0000).

Furthermore, the same findings were evident within each linguistic condition. Children in the Definition condition provided more "*semantic*" properties in their definitions than the children in the other conditions (see Appendix 5.19). Statistical analysis revealed that the

[1]Use of basic and superordinate level words were added making one category called semantic properties

children in the Definition condition provided significantly more "*semantic*" properties than the children in the Lexical contrast condition in the immediate (Wilcoxon: Z=2.1, $p<.05$) and the Delayed post tests (Wilcoxon: Z=2.2, $p<.05$). Furthermore, during the Delayed post test, there was a trend for the children in the Definition condition to provide more "*semantic*" properties than the children in the Inference and Analogy condition. Analysis within the semantic properties revealed that the children provided significantly more "*basic level*" than "*superordinate level*" words when they defined the target word in the immediate (Wilcoxon: Z=6.7, $p<.0000$) and delayed post tests (Wilcoxon: Z=6.1, $p<.0000$).

Children in the Analogy condition also provided more "*functional properties*" than children in the other conditions during the immediate post test (see Appendix 5.16). During the Delayed post test children in the Inference and Analogy conditions provided more "*functional properties*" than children from the other conditions.The differences were significant only for the Delayed post test (Kruskal-Wallis, 1-Way ANOVA: $X^2= 8.05$, df=3, $p<.05$). Post hoc analysis revealed that children in the Inference and Analogy condition provided more "*functional properties*" than the children in the Definition condition (Wilcoxon: Z=2.5, $p<.05$) and (Wilcoxon: Z=2.2, $p<.05$).

Key findings from the definition task

To what extent does children's performance on the definition task differ by age ?

- Significant correlations were found between children's age and their performance on the definition task for both post tests. The same pattern was evident even when children's vocabulary and memory scores were controlled for.

- The older children performed better than the younger ones. Significant differences were found for both post tests. Particularly, the 6- and 5 year-olds performed significantly better than the 4 year-olds. Also, the 6 year-olds performed significantly better than the 5 year-olds. The same pattern was also found within each linguistic condition for both post tests.

To what extent does children's performance on the definition task differ by linguistic condition?

- Analysis of the immediate post test revealed that there was a trend for the children in the Inference and Definition condition to perform better in the definition task than the children in the Lexical contrast condition. Furthermore, the children in the Analogy condition performed significantly better than children in the Lexical contrast condition. No significant differences were found during the delayed post test.
- Linguistic condition differences within each age group were also investigated. The same pattern was found within each age group. Particularly, the 4 year-olds in the Analogy condition performed significantly better than the 4 year olds in the Lexical contrast condition during the delayed post test. Furthermore, there was a trend for the 6 year-olds in the Definition condition to perform better than the 6 year-olds in the Analogy and Lexical contrast conditions during the immediate post test. Additionally, the 6 year-olds in the Inference condition performed significantly better than the 6 year-olds in the Definition and Contrast conditions during the delayed post test .

To what extent does children's success on the definition task change between the immediate and delayed post test ?

- No significant differences between the immediate and the delayed post test were found. Comparison of children's performance between the two post tests within each age group and linguistic condition revealed the same pattern.

To what extent does children's performance on the definition task differ by their existing vocabulary?

- No significant differences were found in children's performance on the definition task by their existing vocabulary. The same pattern was evident within each age group and linguistic condition.

To what extent does children's performance on the definition task differ by their phonological memory?

- Children with high phonological memory performed better than children with low phonological memory for both post tests. Significant differences were found during the immediate post test. The same pattern was found within each age group and linguistic condition. Significant differences were found for the Lexical contrast condition.

Error Analysis

- Children in their definitions focused on the following properties:(a) Perceptual; (b) Functional;(c)Semantic.All the children provided less "*perceptual*" than "*functional*" and "*semantic*" properties for both post tests. Furthermore, they also provided significantly more "*semantic*" than "*functional*" properties for both post tests. The same pattern was evident within each age group. Also, the older the children they were, the more semantic properties they used in their definitions.

- Children in the Definition condition provided more "*semantic*" properties than those in the other conditions.Children in the Analogy condition also provided more "*functional*" properties than those in the other conditions during the immediate post test, while in the delayed post test, children in the Inference and Analogy conditions provided more "*functional*" properties than children in the other conditions. The differences were significant only for the delayed post test.

- Analysis within the semantic properties revealed that the children provided significantly more "*basic level*" than "*superordinate level*" words when they defined the target words at both post tests.

Concluding remarks for the definition task

- Analysis of the Definition task demonstrated age differences with the 5-and 6 year-olds performing better than the 4 year-olds. This pattern was also evident within each linguistic condition. Analysis by linguistic condition demonstrated that the children in the Inference and Definition condition performed better in the definition task than children in the other conditions. No significant differences between children's performance in the immediate and delayed post test were found. Also, no differences in their performance were found by their existing vocabulary. Lastly, it was found that children with high phonological memory performed significantly better than children with low phonological memory at both post tests. The same pattern was evident within each age group and linguistic condition.

5.4.2.2.4 Analogy task

Scoring criteria for the analogy task

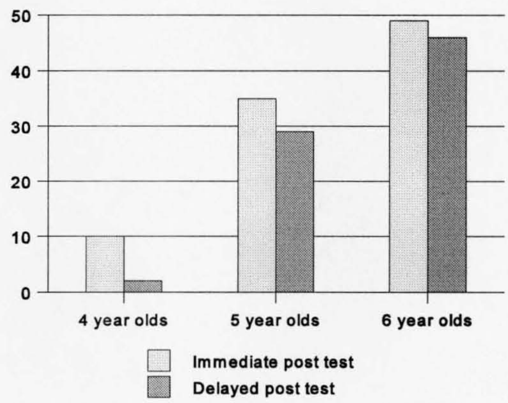
In each trial the child had to answer two questions for the puppet.. To be correct, the response had to be an appropriate answer to the analogy task, while incorrect was scored if the child provided an inappropriate answer. All the responses that referred to another item from the same semantic category as similar to the target word were counted as appropriate answers to the analogy task ("*Do you know anything else like this* (the target item) ?"). Each child could get a score from 0-2.

Analysis

To what extent does children's performance on the analogy task differ by age ?

If all children from each age group were correct on the two target words, the maximum total score would be 128 for each age group in each post test. Figure 5.13 demonstrates children's performance on the analogy task by age for both post tests.

Figure 5.13 Total number of correct responses in the analogy task by age for both post tests



Significant correlations were found between children's age and their performance on the analogy task for both post tests. The same pattern was evident when children's vocabulary and memory scores were controlled for (see Table in Appendix 5.20 for correlations).

As the figure above illustrates, the older children performed better than the younger ones. In order to investigate whether the differences were significant, two one Way ANOVAs were carried out for each post test. Age was the independent factor and score on the analogy task was the dependent factor. Significant differences were found both for the immediate post test (Kruskal-Wallis, 1 Way ANOVA: $X^2 = 18.5$, df=2, $p<.0005$) and the delayed post test (Kruskal-Wallis, 1 Way ANOVA: $X^2 = 23.01$, df=2, $p<.0000$).

Post hoc analysis for the immediate post test, revealed that the 5 year-olds performed significantly better than the 4 year-olds (Mann-Whitney: Z=3.3 $p<.005$). Also, the 6 year olds performed significantly better than the 4 year-olds (Mann-Whitney: Z=4.2, $p<.0000$). The same pattern was found for the delayed post test (Mann-Whitney: Z=3.2, $p<.005$; Z=4.7, $p<.0000$). No significant differences were found between the 5- and the 6 year-olds.

Whether the same pattern was evident within each linguistic condition was also investigated. Overall, the same pattern was found. Significant differences were found for the Inference condition, during the immediate post test (Kruskall-Wallis, 1 Way ANOVA: $X^2 = 7.1$, df=2, $p<.05$) while a trend for significance for the same pattern was found for the delayed post test. The same pattern was found for the Analogy (immediate: Kruskall-Wallis, 1 Way ANOVA: $X^2 = 19.7$, df=2, $p<.0005$; delayed: Kruskall-Wallis, 1 Way ANOVA: $X^2 = 18.9$, df=2, $p<.0005$) and Lexical contrast conditions (immediate: Kruskal-Wallis,1 Way ANOVA: $X^2 = 10.4$, df=2, $p<.005$; delayed: Kruskall-Wallis, 1 Way ANOVA: $X^2 = 6.9$, df=2, $p<.05$). No significant differences were found for the Definition condition.

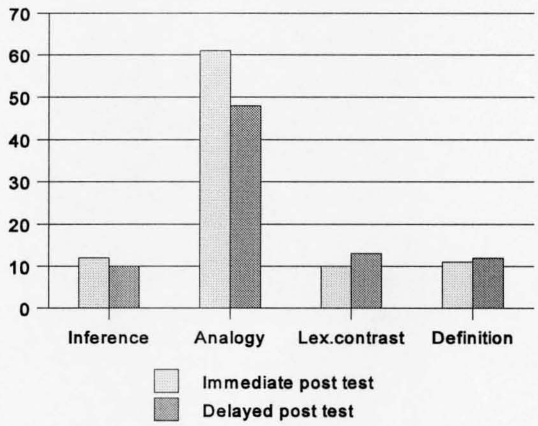
Post hoc analysis of children's responses in the Inference condition revealed that during the immediate post test the 5 year-olds performed significantly better than the 4 year-olds (Mann-Whitney: Z=2.6, $p<.05$). During the delayed post test the 5 year-olds performed significantly better than the 4 year-olds (Mann-Whitney: Z=2.1, $p<.05$). The 6 year-olds also performed significantly better than the 4 year-olds (Mann-Whitney: Z= 2.1, $p<.05$). Post hoc analysis of children's responses in the Analogy condition indicated that during the immediate post test the 5 year-olds performed significantly better than the 4 year-olds (Mann-Whitney: Z=2.6, $p<.05$) and the 6 year-olds performed significantly better than the 4 year-olds (Mann-Whitney: Z= 4.2, $p<.0000$). Also, the 6 year-olds performed significantly better than the 5 year-olds (Mann-Whitney: Z=2.2, $p<.05$). During the delayed post test the 5 year-olds performed significantly better than the 4 year-olds (Mann-Whitney: Z=3.08, $p<.005$) and the 6 year-olds performed significantly better than the 4 year-olds (Mann-Whitney: Z=4.04, $p<.0005$).

Post-hoc analysis of children's responses in the Lexical contrast condition revealed that during the immediate post test the 6 year-olds performed significantly better than the 5- (Mann-Whitney: Z=2.1, p<.05) and the 4 year-olds (Mann-Whitney: Z=2.6, p<.005). During the delayed post test the 6 year- olds performed significantly better than the 4 year-olds (Mann-Whitney: Z=2.4, p<.05).

To what extent does children's performance on the analogy task differ by linguistic condition?

If all children in each linguistic condition were correct on the two target words, the maximum total score would be 96 for each linguistic condition in each post test. Figure 5.14 below illustrates children's performance on the analogy task by linguistic condition in the immediate and the delayed post test.

Figure 5.14 Total number of correct responses in the analogy task by linguistic condition for both post tests



As the figure above shows children in the Analogy condition performed better on the analogy task than children in the other conditions for both post tests. The differences were significant during the immediate (Kruskal-Wallis: 1 Way ANOVA: X^2= 59.8, df=3, p<.0000) and the delayed post test (Kruskall-Wallis, 1 Way ANOVA: X^2= 41.3, df=3, p<.0000). Post hoc analysis revealed that children in the Analogy condition performed significantly better than children in the Inference, (immediate: Mann-Whitney: Z=5.6, p<.0000; delayed: Mann-Whitney: Z=5.03, p<.0000), Definition (immediate. Mann-Whitney: Z=5.7, p<.0000; delayed: Mann-Whitney: Z=4.7, p<.0000) and Lexical contrast condition (immediate: Mann-Whitney: Z=5.8, p<.0000; delayed: Mann-Whitney: Z= 4.5, p<.0000).

Linguistic condition differences within each age group were also investigated. The same pattern was found within each age group. Significant differences were found for the 4 year-olds (immediate: Kruskal-Wallis, 1 Way ANOVA: Z=19.2, df=3, p<.0005), the 5 year-olds (immediate: Kruskall-Wallis, 1 Way ANOVA: X^2= 24.9, df=3, p<.0000; delayed: Kruskall-Wallis, 1 Way ANOVA: X^2= 21.7, df=3, p<.0005) and the 6 year-olds (immediate: Kruskall-Wallis, 1 Way ANOVA: X^2= 30.1 df=3, p<.0000; delayed: Kruskall-Wallis, 1 Way ANOVA: X^2= 22.5, df=3, p<.0005).

Post hoc analysis of the 4 year-olds responses demonstrated that the 4 year-olds in the Analogy condition performed significantly better than the 4 year-olds in the Inference (immediate: Mann-Whitney: Z=2.9, p<.005; delayed: Mann-Whitney: Z=2.1, p<.05), the Definition (immediate: Mann-Whitney: Z=2.4, p<.05) and Lexical contrast conditions (immediate: Mann-Whitney: Z=2.9, p<.005). The same pattern was found for the 5 year-olds. The 5 year-olds in the Analogy condition performed significantly better than the 5 year-olds in the Inference (immediate: Mann-Whitney: Z=2.8, p<.005; delayed: Mann-Whitney: Z=3.08, p<.005), Definition (immediate: Mann-Whitney: Z=3.6, p<.0005; delayed: Mann-Whitney: Z=3.5, p<.0005) and Lexical contrast conditions (immediate: Mann-Whitney: Z=4.2, p<.0000; delayed: Mann-Whitney: Z=3.6, p<.0005). Lastly, the 5 year-olds in the Inference condition performed significantly better than the 5 year-olds in the Lexical contrast condition (immediate: Mann-Whitney: Z=2.1, p<.05).

The same pattern was evident for the 6 year-olds. The 6 year-olds in the Analogy condition performed significantly better than the 6 year-olds in the Inference, (immediate: Mann-Whitney:Z=4.7, p<.0000;delayed: Mann-Whitney: Z=4.04, p<.0005), Definition (immediate: Mann-Whitney: Z=4.3, p<.005; delayed: Mann-Whitney: Z=3.6, p<.05) and Lexical contrast conditions (Immediate: Mann-Whitney: Z=4.02, p<.0005; Delayed: Mann-Whitney: Z=3.3, p<.005).

To what extent does children's success in the analogy task change between the immediate and delayed post test ?

In the immediate post test children provided 48.9% correct responses, while in the delayed post test they provided 43.2% correct responses. Statistical analysis revealed no significant differences between the two post tests. Comparison of children's performance between the two post tests within each age group and linguistic condition revealed the same pattern. However, the within linguistic condition analysis revealed significant differences only for the Analogy condition. The children performed significantly better during the delayed than the immediate post test (Wilcoxon: $Z=1.9$, $p<.05$).

To what extent does children's performance on the analogy task differ by their existing vocabulary ?

Children's performance did not differ significantly by their existing vocabulary. The same pattern was found within each age group and linguistic condition (see Table in Appendix 5.9).

To what extent does children's performance on the analogy task differ by their phonological memory?

Children with high phonological memory performed better on the analogy task than children with low phonological memory (see Table in Appendix 5.10), however the differences were not significant. Analysis within each age group revealed the same pattern. Significant differences were found during the delayed post test, for the 4 year- olds (Mann-Whitney: $Z=1.9$, $p<.05$), and the 5 year-olds (Mann-Whitney: $Z=2.4$, $p<.05$). The same pattern was also evident within each linguistic condition. Significant differences were found for the Definition condition during the immediate post test (Mann-Whitney: $Z=2.3$, $p<.05$).

Error analysis

Different responses were given in the analogy task. An Error analysis was carried out to identify the different types of responses given. These are presented in Table 5.13 below.

Table 5.13 Children's responses in the analogy task

Responses	Description
Don't know	If no responses were provided
Irrelevant responses	If they gave irrelevant responses
Shape similar word	E.g. "*abez is like a tube*" and "*feber is like a triangle*
Use of a basic level word	Provision of a basic level word from the same semantic category "*abez is like a recorder*"
Given analogy	Provision of the analogy e.g. "*abez is like a flute*"

The distribution of children's responses in the immediate and delayed post test is presented on Table 5.14. Results from both target words are presented together, since children's performance on the analogy task did not differ by target item.

5.14 Children's responses in the analogy task for both post tests

	Immediate post test		Delayed post test	
	%	**n**	**%**	**n**
Don't know	72.1	277	76.3	293
Irrelevant	1.3	5	1.6	6
Shape similar word	2.08	8	0.5	2
Basic level word	8.1	31	7.8	30
Given analogy	16.4	63	13.8	53
N of responses	384		384	

The analogy task was quite difficult for the children since there was a high percentage of "*don't know*" responses (72.1% in the immediate post test and 76.3% in the delayed post test). From the responses provided, most of the children used the "*given analogy*" (the analogy given during the analogy condition) as well as "*another basic level word*" from the same semantic category.

The distribution of responses separately by age and linguistic condition was also investigated. The results are presented in Appendices 5.21 and 5.22. The same pattern was evident within each age group and linguistic condition analysis except for the Analogy condition. In the Analogy condition the pattern changes. Most of the children provided more "*given analogies*" than other responses for both post tests (16.4% in the immediate post test and 13.8% in the delayed post test). Statistical analysis was carried out to explore whether the differences were significant. The differences were significant during the Analogy condition for both post tests (immediate post test: $Z=5.08$, $p<.0000$; delayed post test: $Z=4.2$, $p<.0000$).

Key findings from the analogy task

To what extent does children's performance on the analogy task differ by age ?

- Significant correlations were found between children's age and their performance on the Analogy task for both post tests. The same pattern was found when children's vocabulary and memory scores were controlled for.

- The older children performed better than the younger ones. Age was a significant factor for children's performance for both post tests. Post hoc analysis for the immediate post test revealed that the 5- and 6 year-olds performed significantly better than the 4 year-olds. No significant differences were found between the 5- and the 6 year-olds. The same pattern was found for the delayed post test.

- The same pattern was evident within each linguistic condition for both post tests. Significant differences were found in the Inference, Analogy and Lexical contrast conditions. No significant differences were found in the Definition condition.

To what extent does children's performance on the analogy task differ by linguistic condition?

- Children's performance on the analogy task differed significantly by linguistic condition for both post tests. Children in the Analogy condition performed significantly better than children in the other conditions. The same pattern was also found within each age group.

To what extent does children's success in the analogy task change between the immediate and delayed post test ?

- There was a trend for the children to perform worse during the delayed than the immediate post test. The same pattern was found within each age group and linguistic condition except for the Analogy condition. Children from the Analogy condition performed significantly better during the delayed than the immediate post test.

To what extent does children's performance on the Analogy task differ by their existing vocabulary?

- Children's performance did not differ significantly by their existing vocabulary. The same pattern was found within each age group and linguistic condition.

To what extent does children's performance on the analogy task differ by their phonological memory?

- There was a trend for the children with high phonological memory to perform better on the analogy task than the children with low phonological memory. Analysis within each age group revealed the same pattern. Significant differences were found for the 4- and the 5 year-olds during the delayed post test. The same pattern was evident within each linguistic condition. Significant differences were found for the Definition condition during the immediate post test.

Error analysis

- Different responses were given by the children to the Analogy task which were the following: (a) *"No responses"* (b) *"Irrelevant responses"* (c) *"Shape similar word"*(d) *"Use of a basic level word"*(e) *"Given analogy"*.

- The analogy task was quite difficult for the children since there was a high percentage of *"don't know"* responses. From the responses given, most of the children provided *"given analogies"* as well as *"basic level word"* responses. The same pattern was evident within each age group and each linguistic condition except for the Analogy condition. In the Analogy condition most of the children provided significantly more *"given analogies"* than other responses at both post tests.

Concluding remarks for the analogy task

- The analysis of the Analogy task demonstrated that the 5- and the 6 year-olds performed significantly better than the 4 year-olds for both post tests. The same pattern was also found within each linguistic condition. Differences by linguistic condition were also found. The children in the Analogy condition performed significantly better than the children in the other conditions for both post tests. Also the children performed better during the immediate than the delayed pos test. On the other hand, children in the Analogy condition performed significantly better during the delayed than the immediate post test. No significant differences in children's performance were found by their existing vocabulary. On the other hand, there was a trend for the children with high phonological memory to perform better than the children with low phonological memory for both post tests. The same pattern was found within each age group. Significant differences were found for the 4- and 5 year-olds. Furthermore, significant differences were found for the Definition condition.

5.4.2.2.5 Contrast task

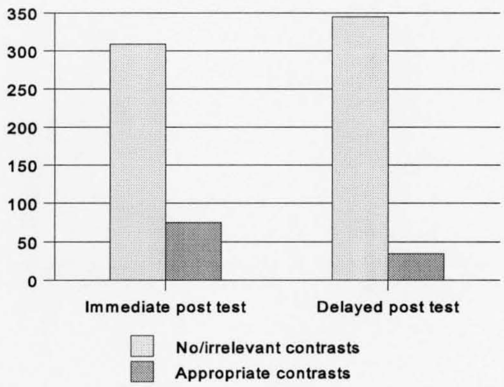
Scoring criteria for the contrast task

Each child was asked two questions, one per target word. Provision of appropriate contrasts was scored as correct, while provision of inappropriate contrasts was scored as incorrect. For the present experiment appropriate contrast was considered if the target word was different from another item from the same semantic category (e.g. appropriate contrast for the abez (oboe) was any musical instrument contrast, while appropriate contrast for the feber (tepee) was any type of house contrast). All the other contrasts were considered as inappropriate. Each child could get a score from 0 - 2.Qualitative analysis of children's contrasts was also carried out.

Analysis

If all children were correct on the two target words, the maximum total score would be 384 for all the participants in each post test. As the Figure 5.15 below shows, most of the children provided *"don't know /irrelevant"* responses for both post tests. The contrast task was quite difficult for the children.

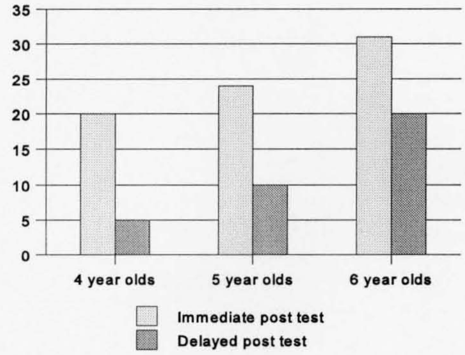
Figure 5.15 Children's performance on the contrast task for both post tests



To what extent does children's performance on the contrast task differ by age ?

If all children from each age group were correct on the two target words, the maximum total score would be 128 for each age group in each post test. Figure 5.16 below demonstrates children's performance on the contrast task by age for both post tests.

Figure 5.16 Total number of correct responses on the contrast task by age for both post tests



Significant correlations were found between children's age and their performance on the contrast task during the delayed post test. The same pattern was found when their vocabulary scores were controlled for but not when their memory scores were controlled for (see Table in Appendix 5.23 for correlations).

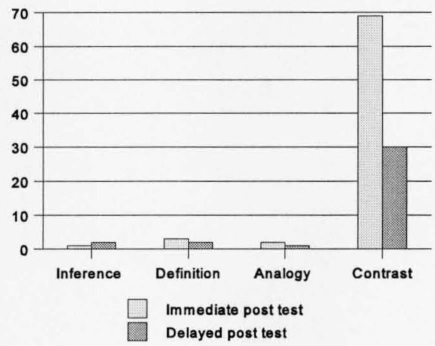
As figure 5.16 illustrates, the older children performed better than the younger ones. In order to further investigate whether the differences were significant two one Way ANOVAs were carried out for the two post tests. Age was the independent factor and score in the contrast task was the dependent factor. Significant differences were found for the delayed post test (Kruskal-Wallis, 1 Way ANOVA: X^2= 6.6, df=2, p<.05). Post hoc analysis for the delayed post test revealed that the 6 year-olds performed significantly better than the 4 year-olds (Mann-Whitney: Z=2.3 p<.05). There was also a trend for the 6 year-olds to perform better than the 5 year-olds. No significant differences were found for the immediate post test.

Whether the same pattern was evident within each linguistic condition was also investigated. Significant differences were found for the contrast condition for both post tests (Immediate: Kruskal-Wallis, 1 Way ANOVA: X^2= 6.8, df=2, p<.05; Delayed: Kruskal-Wallis, 1 Way ANOVA: X^2= 6.5, df=2, p<.05). Post hoc analysis revealed that the 6 year-olds performed significantly better on the contrast task than the 4 year-olds for both post tests (immediate: Mann-Whitney: Z=2.5, p<.05; delayed: Mann-Whitney: Z=2.5, p<.05). No significant differences were found for the other linguistic conditions.

To what extent does children's performance on the contrast task differ by linguistic condition ?

If all children from each linguistic condition were correct on the two target words, the maximum total score would be 96 each linguistic condition in each post test. Figure 5.17 below shows children's performance on the contrast task by linguistic condition for both post tests. As the figure shows, children in the Lexical contrast condition performed better on the contrast task than the children in the other conditions for both post tests. The differences were significant for the immediate (Kruskal-Wallis, 1 Way ANOVA: X^2= 120.8, df=3, p<.0000) and the delayed post test (Kruskal-Wallis, 1 Way ANOVA: X^2= 46.8, df=3, p<.0000).

Figure 5.17 Total number of correct responses on the contrast task by linguistic condition for both post tests



Linguistic condition differences within each age group were also investigated. Children's performance on the contrast task within each age group differed by linguistic condition. The 4 year-olds in the Contrast condition performed significantly better on the contrast task than the 4 year-olds in the other conditions during the immediate post test (Kruskal-Wallis, 1 Way ANOVA: X^2= 25.6, df=3, p<.0000). A trend for significance for the same pattern was found for the delayed post test. Significant differences were also found for the 5 year-olds (immediate: Kruskal-Wallis, 1 Way ANOVA: X^2= 44.3, df=3, p<.0000; delayed: Kruskal-Wallis, 1 Way ANOVA: X^2= 19.5, df=3, p<.0005) and the 6 year-olds (immediate: Kruskal-Wallis, 1 Way ANOVA: X^2= 52.03, df=3, p<.0000; delayed: Kruskal-Wallis, 1 Way ANOVA: X^2= 23.6, df=3, p<.0000).

Post hoc analyses indicated that the 4 year-olds in the Contrast condition performed significantly better on the contrast task than the children in the Inference (Mann-Whitney: Z=3.6, df=3, p<.0005), Analogy (Mann-Whitney: Z=3.1, p<.005) and Contrast conditions

(Mann-Whitney: Z=3.3, p<.005) during the immediate post test. The same pattern was found for the 5 year-olds during the immediate (Mann-Whitney: Z=4.4, p<0000; Z=4.4, p<.0000; Z=4.2, p<.0000) and the delayed post test (Mann-Whitney: Z=2.6, p<.05; Z=2.6, p<.05; Z=2.6, p<05) as well as for the 6 year-olds during the immediate (Mann-Whitney: Z=5.04, p<.0000; Z=5.04, p<.0000; Z=5.1, p<.0000) and the delayed post test: (Mann-Whitney: Z=3.1, p<.005 Z=3.3, p<.005; Z=3.3, p<.005).

To what extent does children's success in the contrast task change between the immediate and delayed post test ?

Children in the immediate post test provided 39.1% correct responses, while in the delayed post test they provided 18.2% correct responses. Statistical comparison between the two post tests revealed that they performed significantly better during the immediate than the delayed post test. Comparison of children's performance between the two post tests within each age group revealed the same pattern for the 4 year-olds (Wilcoxon: Z=2.9, p<.005) and the 5 year-olds (Wilcoxon: Z=2.6, p<.05). The same pattern was found for the 6 year-olds, however, the differences were not significant. Comparison of children's performance between the two post tests within each linguistic condition revealed the same pattern. Significant differences were found for the Contrast condition (Wilcoxon: Z= 4.3, p<.0000). No significant differences were found for the other conditions.

To what extent does children's performance on the contrast task differ by their existing vocabulary?

Children's performance on the contrast task did not differ by their existing vocabulary. The same pattern was found within each age group) and linguistic condition (see Table in the Appendix 5.9.

To what extent does children's performance on the contrast task differ by their phonological memory?

Children's performance on the contrast task did not differ significantly by their phonological memory (see Table in Appendix 5.10). The same pattern was found within each age group and linguistic condition except for the Contrast condition. Children with high phonological memory from the Contrast condition performed significantly better than children with low phonological memory during the immediate (Mann-Whitney: Z=2.2, p<.05) and the delayed post test (Mann-Whitney: Z=2.3, p<.05).

Error analysis

An Error analysis was carried out to identify the different types of responses given in the contrast task. These are presented in Table 5.15 below.

Table 5.15 Children's responses in the contrast task

Responses	Description
Don't know	If no responses were given
Use of a basic level word	Use of a basic level word from the same semantic category e.g. *abez is different from a trumpet*, or *feber is different from a house*
Given contrast	Use of the given contrast e.g. *abez is different from a piano and a guitar* and *feber is different from a caravan.*

The distribution of children's responses for both post tests is presented in Table 5.16. Results from both target words are presented together, since children's performance on the contrast task did not differ by target item.

Table 5.16 Children's responses in the contrast task for both post tests

Responses	Immediate post test		Delayed post test	
	%	**n**	**%**	**n**
Don't know	80.4	309	90.8	349
Basic level word	1.6	6	1.6	6
Given contrast	18	69	7.5	29
N of responses		384		384

The contrast task was difficult for the children since there was a high percentage of "*don't know*" responses (80.4% in the immediate post test and 90.8% in the delayed post test).From the responses provided, most of the children used the "*given contrast*" than another "*basic level word*" from the same semantic category. The differences were significant both for the immediate (Wilcoxon: Z=5.2, p<.0000) and the delayed post test (Wilcoxon: Z=3.1, p<.005).

The distribution of responses separately by age and linguistic condition was also investigated. Appendices 5.24 and 5.25 present the results. The same pattern was found within each age group. The analysis within each linguistic condition indicated that the children from the Contrast condition provided more *"given contrast"* responses (71.9%) than *"don't know"* responses during the immediate post test. Statistical analysis revealed that the differences were significant during the immediate post test (Wilcoxon: $Z=2.8$, $p<.005$).

Key findings from the contrast task

To what extent does children's performance on the contrast task differ by age ?

- Significant correlations were found between children's age and their performance on the contrast task during the delayed post test. The same pattern was found when children's vocabulary and memory scores were controlled for.
- The older children performed better than the younger ones. Significant differences were found for the delayed post test. Particularly, the 6 year-olds performed significantly better than the 4 year-olds. There was also a trend for the 6 year-olds to perform better than the 5 year- olds. The same pattern was evident for the Contrast condition for both post tests. No significant differences were found for the other linguistic conditions.

To what extent does children's performance on the contrast task differ by linguistic condition?

- Children in the Contrast condition performed significantly better on the contrast task than children in the other conditions for both post tests. Children's performance on the contrast task within each age group differed significantly by linguistic condition for both post tests. Each age group in the Contrast condition performed significantly better than children in the other conditions.

To what extent does children's success in the contrast task change between the immediate and the delayed post test ?

- The children performed significantly better during the immediate than the delayed post test. Comparison of children's performance between the two post tests within each age group revealed the same pattern for the 4 year-olds and the 5 year-olds. The same pattern was found for the 6 year-olds, however, the differences were not significant. Comparison of children's performance between the two post tests within each linguistic condition revealed the same pattern only for the Contrast condition.

To what extent does children's performance on the contrast task differ by their existing vocabulary?

- Children's performance on the contrast task did not differ by their existing vocabulary. The same pattern was found within each age group and linguistic condition.

To what extent does children's performance on the contrast task differ by their phonological memory?

- Children's performance in the contrast task did not differ significantly by their phonological memory. The same pattern was found within each age group and linguistic condition except for the Contrast condition.Children with high phonological memory in the contrast condition performed significantly better than children with low phonological memory for both post tests.

Error analysis

- Different responses were given by the children in the contrast task. These are the following: (a) *"No responses"*; (b)*"Use of a basic level word"* (c) *"Given contrast"*. From the responses provided, most of the children provided significantly more "*given contrast*" responses than "*basic level word*" responses from the same semantic category. The same pattern was evident within each age group and linguistic condition.

Concluding remarks for the contrast task

- The analysis of the contrast task demonstrated that the older children performed better than the younger ones for both post tests. The same pattern was found for the Contrast condition. Differences by linguistic condition were also found. The children in the Contrast condition performed better than the children in the other conditions for both post tests. Overall, they performed better during the immediate than the delayed post test. Children's performance on the contrast task did not differ by their existing vocabulary and by their phonological memory except for the Contrast condition. Particularly, the children in the contrast condition with high phonological memory performed better than the children with low phonological memory.

5.4.2.2.6 Sentence generation task

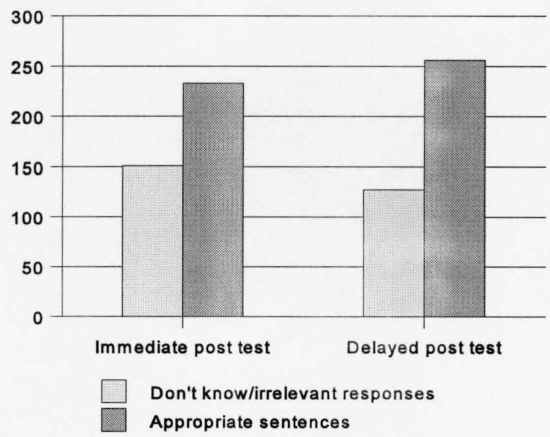
Scoring criteria for the sentence generation task

Each child was asked to make up two sentences which included the target words. To be scored correct, the child had to use either the target word or an acceptable alternative (e.g. pronouns) in an appropriate sentence context and incorrect the use of the new word in an inappropriate sentence context or a "*don't know*" response. For the present experiment an appropriate sentence context had to include any of the following information about the target words: a) perceptual e.g. *the abez is long, thin with holes* b) functional e.g. *the boy plays music with the abez* c) semantic e.g. *the feber is a house*. Each child could get a maximum score from 0-2.

Analysis

If all children were correct on the two target words, the maximum total score would be 384 for all the participants in each post test. Figure 5.18 below shows children's performance on the sentence generation task for both post tests. As the Figure shows, 233 of children's responses were appropriate sentences during the immediate post test, while 256 of their responses were appropriate sentences in the delayed post test.

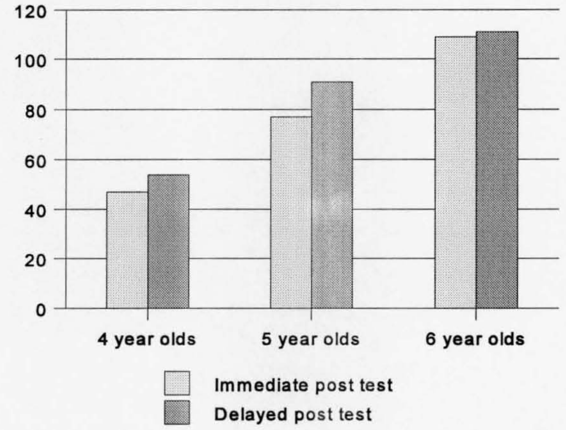
Figure 5.18 Children's performance on the sentence generation task for both post tests



To what extent does children's performance on the sentence generation task differ by age ?

If all children from each age group were correct on the two target words, the maximum total score would be 128 for each age group in each post test. Figure 5.19 below demonstrates children's performance on the sentence generation task by age for both post tests.

Figure 5.19 Total number of correct responses on the sentence generation task by age for both post tests



Significant correlations were found between children's age and their performance on the sentence generation task for both post tests. The same pattern was evident when their vocabulary and memory scores were controlled for (see Appendix 5.26 for correlations). As the above figure shows the older children performed better than the younger ones for both post tests. Two one way ANOVAs with age as the independent factor and scores on the sentence generation task as the dependent measure for the both post tests were carried out to investigate the differences. Significant differences were found during the immediate post test (Kruskal-Wallis 1-Way ANOVA: X^2= 44.2, df=2, p<.0000) and the delayed post test (Kruskal-Wallis 1-Way ANOVA: X^2= 37.4, df=2, p<.0000).

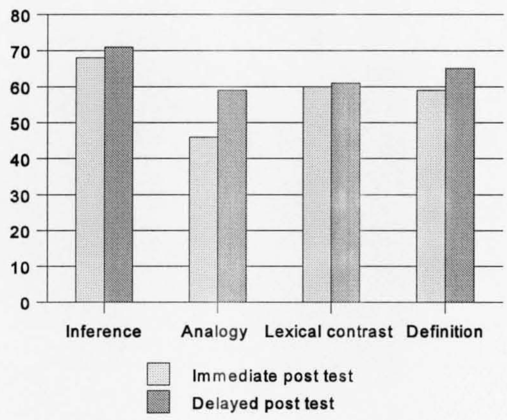
Post-hoc analyses revealed that the 5 year-olds performed significantly better than the 4 year-olds during the immediate (Mann-Whitney: Z=3.2, p<.005) and the delayed post test (Mann-Whitney: Z=3.7, p<.0005). Additionally, the 6 year-olds performed significantly better than the 4 year-olds during the immediate (Mann-Whitney: Z=6.4, p<.0000) and the delayed post test (Mann-Whitney: Z=5.9, p<.0000). Furthermore, the 6 year-olds performed significantly better than the 5 year-olds during the immediate post test (Mann-Whitney: Z=4.04, p<.0005) and the delayed post test (Mann-Whitney: Z=2.4, p<.05).

Whether the same pattern was evident within each linguistic condition was also investigated. The same pattern was found for the inference condition [(immediate: Kruskal-Wallis 1-Way Anova: X^2= 10.7, df=2, p<.005); (delayed: Kruskal-Wallis 1-Way Anova: X^2= 12.4, df=2, p<.005)], Definition condition [(immediate: Kruskal-Wallis 1-Way Anova: X^2= 12.8, df=2, p<.005); (delayed post test: Kruskal-Wallis 1-Way Anova: X^2= 8.49, df=2, p<.05)]; the Analogy condition [(immediate: Kruskal-Wallis 1-Way Anova: X^2= 12.4, df=2, p<.005); (Delayed: Kruskal-Wallis 1-Way Anova: X^2= 10.5, df=2, p<.005)]; and Contrast condition [(immediate: Kruskal-Wallis 1-Way Anova: X^2= 13.7, df=2, p<.005); (delayed: Kruskal-Wallis 1-Way Anova: X^2= 7.7, df=2, p<.05)].

To what extent does children's performance on the sentence generation task differ by linguistic condition ?

If all children from each linguistic condition were correct on the two target words, the maximum total score would be 96 for each linguistic condition and each post test. Figure 5.20 below demonstrates children's performance on the sentence generation task by linguistic condition for both post tests.

Figure 5.20 Total number of correct responses in the sentence generation task by linguistic condition for both post tests



As the figure above shows children in the Inference condition performed better than the children in the other conditions. Children's responses were analysed using two ANOVAs with scores in the sentence generation task as the dependent factor and linguistic condition as the independent factor. There was a trend for significance for the differences during the immediate post test, while no significant differences were found during the delayed post test. Post hoc analysis during the immediate post test demonstrated that children in the Inference condition performed significantly better than the children in the Analogy condition (Mann-Whitney: Z=2.6, p<.05). Furthermore, during the delayed post test there was a trend for the children in the Inference condition to perform better than the children in the Definition condition.

It was also investigated whether the same pattern was evident within each age group. The same pattern was found within each age group for both post tests. Significant differences were found for the 5 year-olds in the immediate post test (Kruskal-Wallis 1-Way Anova: X^2= 12.9, df=3, $p<.005$). Post hoc analysis revealed that children in the Inference condition performed significantly better than those in the Analogy condition (Mann-Whitney: Z=3.2, $p<.005$). Furthermore, children in the Definition group performed significantly better those in the Analogy condition (Mann-Whitney: Z=2.5, $p<.05$). Also, the children in the Contrast condition performed significantly better than children in the Analogy condition (Mann-Whitney: Z=2.1, $p<.05$).

To what extent does children's success on the sentence generation task change between the immediate and delayed post test ?

All the children performed significantly better during the delayed than the immediate post test (Wilcoxon: Z=2.4, $p<.05$). Whether the same pattern was the same within each age group was also investigated. The same pattern was found in each age group. Significant differences were found for the 5 year-olds (Wilcoxon: Z=2.1, $p<.05$). Lastly, whether the same pattern was evident within each linguistic condition was investigated. The same pattern was found within each linguistic condition. Significant differences were found for the Analogy condition (Wilcoxon: Z=2.4, $p<.05$).

To what extent does children's performance on the sentence generation task differ by their existing vocabulary?

No significant differences were found in children's performance on the sentence generation task by their existing vocabulary knowledge. The same pattern was found within each age group and linguistic condition (see Table in Appendix 5.9).

To what extent does children's performance on the sentence generation task differ by their phonological memory?

Children's performance on the sentence generation task differed significantly by their phonological memory both in the immediate (Mann-Whitney: Z=2.6, $p<.05$) and the delayed post test (Mann-Whitney: Z=2.9, p<.005) (see Table in Appendix 5.10. The same pattern was evident within each age group. Significant differences were found for the 6 years-old both for the immediate (Mann-Whitney: Z=2.6, p<.05) and the delayed post test (Mann-Whitney: Z=2.9, p<.005). Whether the same pattern was evident within each linguistic condition was also investigated. The same pattern was found for the Analogy condition during the immediate (Mann-Whitney: Z=2.01, p<.05) and the delayed post tests (Mann-Whitney: Z=2.2, p<.05). The same pattern was found for the Contrast condition for both post tests. A trend for significance was found during the immediate post test, while significant differences were found during the delayed post test (Mann-Whitney: Z=3.2, p<.005).

Error analysis

Different sentences were provided by the children in the sentence generation task. An Error analysis was carried out to identify the different types of properties that children focused on in their made up sentences. The different properties are presented in Table 5.17

Table 5.17 **Types of properties identified in children's sentences**

Properties	Description
Don't know	If they did not provide any answer
Idiosyncratic properties	Sentences that focused on idiosyncratic relations e.g "*they are friends*" for abez and flute
Perceptual properties	If the sentences focused on perceptual properties. e.g they have the same shape for abez and flute.
Functional properties	Eg. " *the boy plays music with it*, for abez, or "the *Indians make it*" for the feber.
Semantic properties	When they categorized the items by using a basic level word, e.g. "*they are recorders*" for abez and flute, or a superordinate level word, e.g. "*they are instruments*" or "*they are houses*.

The distribution of children's responses across testing is presented in Table 5.18 for both target words, since children's responses on the sentence generation task did not differ by target item.

Table 5.18 Children's responses on the sentence generation task for both post tests

	Immediate post test		Delayed post test	
	%	n	%	n
Don't know	33.3	128	27.1	104
Idiosyncratic properties	6	23	6.3	24
Perceptual properties	10.9	42	8.8	34
Functional properties	41.7	160	53.4	205
Semantic properties	8.1	31	4.4	17
N of responses	384		384	

Children's given sentences were mainly focused on the "*functional properties*" of the items for both post tests. Statistical analysis revealed that the children provided significantly more "*functional*" than "*perceptual*" (Immediate: Wilcoxon: Z=6.7, p<.0000; delayed: Wilcoxon: Z=4.9, p<.0000) and "*semantic*" properties (immediate: Wilcoxon: Z=7.3, p<.0000; delayed: Z=9.08, p<.0000). Focus on "*perceptual*" properties was another popular choice for both post tests. Significant differences were found during the delayed post test, where they provided significantly more "*perceptual*" than "*semantic*" properties (Wilcoxon: Z=8.09, p<.0000). Lastly, fewer children made up sentences which focused on the "*semantic*" properties of the target items for both post tests.

Whether the same pattern was evident within each age group and each linguistic condition was also investigated. The distribution of responses separately by age and linguistic condition is presented in Appendices 5.27 and 5.28 respectively. The table in Appendix 5.24 shows that the older children provide fewer "*don't know*" responses than the younger ones for both post tests. Furthermore, the 4- and 5- year olds focus mainly on the "*functional*" properties of the items and then on the "*perceptual*" properties. The 6 year-olds focus on the "*functional*" properties but they also start focusing on the "*semantic*" properties.

The table in Appendix 5.25 shows that children from all the linguistic conditions provided more "*functional*" than other properties. "*Perceptual*" properties were also provided less frequently. Particularly, from the responses given, it was found that the children in the Inference condition provided significantly more "*functional*" than "*perceptual*" (immediate: Wilcoxon: Z= 4.1, p<.0000; Delayed: Wilcoxon: Z=3.4, p<.0005) and "*semantic*" properties (Immediate: Wilcoxon: Z= 4.5, p<.0000; Delayed: Wilcoxon: Z=5.02, p<.0000). Furthermore, they provided significantly more "*functional*" properties than "*don't know*" responses (Wilcoxon: Z=2.1, p<.05). In the delayed post test they provided significantly more "*perceptual*" than "*semantic*" properties (Wilcoxon: Z=4.04, p<.0005).

Children in the Analogy condition provided significantly more "*functional*" than "*perceptual*" (immediate: Wilcoxon: Z= 2.7, p<.005; delayed: Wilcoxon: Z=2.8. p<.005) and "*semantic*" properties (immediate: Wilcoxon: Z= 3.3, p<.005; delayed: Wilcoxon: Z=3.9, p<.0005) for both post tests. During the delayed post test, they provided significantly more "*perceptual*" than "*semantic*" properties (Wilcoxon: Z=3.2, p<.005).

Children in the Contrast condition provided significantly more "*functional*" than "*perceptual*" (immediate: Wilcoxon: Z= 3.1, p<.005; delayed: Wilcoxon: Z=2.2, p<.05) and "*semantic*" properties (immediate: Wilcoxon: Z= 3.6, p<.0005; delayed: Wilcoxon: Z=4.6, p<.0000). During the delayed post test they provided significantly more "*perceptual*" than "*semantic*" properties (Wilcoxon: Z= 3.6, p<.0005).

On the other hand, children in the Definition condition in the immediate post test provided more "*semantic*" properties than the children in the other conditions. The differences were not significant. During the delayed post test they children provided significantly more perceptual than semantic properties (Wilcoxon: Z=4.3, p<.0000).

Key findings from the sentence generation task

To what extent does children's performance on the sentence generation task differ by age ?

- Significant correlations were found between children's age and their performance on the sentence generation task. The correlations were still significant, even when their vocabulary and memory scores were controlled for.

- The older children performed better than the younger ones for both post tests. The same pattern was found within each linguistic condition for both post tests.

To what extent does children's performance on the sentence generation task differ by linguistic condition?

- Significant differences by linguistic condition were found during the immediate post test. Post-hoc analysis indicated that the children in the Inference condition performed significantly better than the children in the Analogy condition. The same pattern was found during the delayed post test, however the differences were not significant.

- The same pattern was evident within each age group. Particularly, the 4 year-olds in the Inference condition performed better than the 4 year-olds in the other conditions for both post tests. The 5 year-olds in the Inference and Definition condition performed significantly better than the 5 year-olds in the Analogy condition during the immediate post test. The same pattern was found during the delayed post test, however, the differences were not significant. Furthermore, there was a trend for the 6 year-olds in the inference condition to perform better than the 6 year-olds in the other conditions for both post tests.

To what extent does children's success on the sentence generation task change between the immediate and delayed post test ?

- All the children performed significantly better in the delayed than the immediate post test. The same pattern was found within each age group. Significant differences were found for the 5 year-olds. The same pattern was only found only for the Analogy condition.

To what extent does children's performance on the sentence generation task differ by their existing vocabulary?

- No significant differences were found in children's performance on the sentence generation task by their existing vocabulary. The same pattern was found within each age group and linguistic condition.

To what extent does children's performance on the sentence generation task differ by their phonological memory?

- Children's performance on the sentence generation task differed significantly by their phonological memory for both post tests. The children with high phonological memory performed significantly better than the children with low phonological memory.The same pattern was evident within each age group. Significant differences were found for the 6 year-old for both post tests.

- The same pattern was evident within each linguistic condition. Significant differences were found for the Analogy condition for both post tests. Furthermore, the same pattern was found for the children from the Contrast condition.

Error analysis

- Children's sentences focused on a variety of properties (idiosyncratic properties, perceptual properties, functional properties, semantic properties). Children's sentences focused mainly on the "*functional*" properties of the items for both post tests Statistical analysis revealed that the children provided significantly more "*functional*" than "*perceptual*" and "*semantic*" properties across testing. Focus on "*perceptual*" properties was another popular choice for both post tests. Children during the delayed post test provided significantly more "*perceptual*" than "*semantic*" properties. Fewer sentences focused on "*semantic*" properties for both post tests.

- Whether the same pattern was evident within each age group was also investigated. The older children provided fewer "*don't know*" responses than the younger ones. The 4 year-olds provided significantly more "*perceptual*" and "*functional*" than "*semantic*" properties for both post tests. The 5- and the 6 year-olds provided significantly more "*functional*" than "*perceptual*" and "*semantic*" properties for both post tests. Furthermore, during the Delayed post test they provided significantly more "*perceptual*" than "*semantic*" properties.

- Within each linguistic condition the children provided more "*functional*" than other properties. Particularly, from the responses given, the children in the Inference condition provided significantly more "*functional*" than "*perceptual*" and "*semantic*" properties for both post tests. Furthermore, during the immediate post test they provided significantly more "*functional*" properties than "*don't know*" responses. In the delayed post test, they provided significantly more "*perceptual*" than "*semantic*" properties.

- Children from the Analogy and Contrast condition provided significantly more "*functional*" than "*perceptual*" and "*semantic*" properties for both post tests. Furthermore, during the delayed post test, they provided significantly more "*perceptual*" than "*semantic*" properties. Children in the definition condition, during the immediate post test provided significantly more "*semantic*" than "*perceptual*"properties, whereas in the delayed post test they provided significantly more "*perceptual*" than "*semantic*" properties.

Concluding remarks for the sentence generation task

- The analysis of the sentence generation task demonstrated that the older children performed better than the younger ones. Differences by linguistic condition were also found. Children in the Inference condition performed better than children in the other conditions. The same pattern was found within each age group. Differences over time were also found. The children performed better during the delayed than the immediate post test. The same pattern was found for the Analogy condition. Children's performance on the sentence generation task did not differ by their existing vocabulary, whereas significant differences were found by their phonological memory. Particularly, the children with high phonological memory performed better than the children with low phonological memory. The same pattern was found within each age group and linguistic condition.

5.4.3 Between and Across tests comparisons

5.4.3.1 Comparison between post-test measures for both post tests

Children's performance across the seven post-test measurements was compared. The responses that were counted as correct for each task were the following:

1.Naming task: accurate naming of the target words

2. Multiple choice task: accurate pointing of the target words

3. Inference task: provision of a correct response

4. Analogy task: provision of appropriate analogy

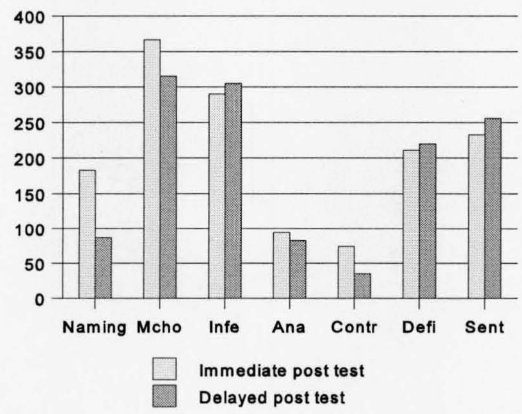
5. Contrast task: provision of appropriate contrast

6. Definition: provision of appropriate definition

7. Sentence generation task: Provision of an appropriate sentence

Figure 5.21 presents children's performance across tasks. As the figure shows children's performance varied by type of measurement (task) for both post tests. Thus, the children performed better on the multiple choice and inference task than the other tasks. Then they performed better on the sentence generation, definition and naming task. The worst performance was observed on the analogy and contrast tasks.

Figure 5.21 Total number of correct responses across tasks for both post tests



Two Friedman Two Way Anovas were carried out to explore whether the differences were significant. The differences were found to be significant both for the immediate (X^2=333.8, df=6, p<.0000) and the delayed post test (X^2=406.5, df=6, p<.0000). Post-hoc analysis revealed that during the immediate post test the children performed significantly better on the multiple choice task than the other tasks. They also performed significantly better on the naming than the analogy and contrast task. They performed significantly better on the inference task than the other tasks except the multiple choice task. Children's performance was also significantly better on the definition and sentence generation task than the analogy and contrast task. Children also performed significantly better on the sentence generation than the naming task. No significant differences were found between children's performance on the analogy and contrast tasks (a floor effect was observed) as well as between the definition and sentence generation tasks and the definition and naming tasks (see Appendix 5.29 for the statistics).

During the delayed post test the children performed significantly better on the multiple choice task than the other tasks except for the inference task. They also performed significantly better on the naming than the contrast task. Children also performed significantly better on the inference task than the other tasks except for the multiple choice task. Children's performance was also significantly better on the analogy than the contrast task. They also demonstrated significantly better performance on the definition than the naming, analogy and contrast tasks. Lastly, children performed significantly better on the sentence generation task than the naming, contrast and definition tasks (see Appendix 5.30 for the statistics).

5.4.3.2 Are there any correlations between children's performance on the naming and multiple choice task?

A series of bivariate correlations were carried out to investigate whether children's performance on the multiple choice task was correlated with their performance on the naming task. There was a trend for children's performance on the multiple choice task to correlate with children's performance on the naming task during the immediate post test, whereas a significant correlation between the two measures was found during the delayed post test (see Appendix 5.31 for correlations).

5.4.3.3 Are there any correlations between children's performance on the naming and the other comprehension tasks for both post tests ?

A series of bivariate correlations between scores in the naming task and the other comprehension tasks were carried out. During the immediate post test children's performance on the naming task was significantly correlated with their performance on the analogy, contrast and definition tasks, whereas no significant correlations were found during the delayed post test (see Appendix 5.32 for correlations).

Key findings from the between and across tasks comparison

Comparison between post tests measurements

- Children's performance was found to vary by the type of measurement for both post tests. Best performance was observed first on the multiple choice task and then on the inference task. Children performed at a lower level on the sentence generation, definition and naming tasks. Worst performance was observed on the analogy and lexical contrast tasks.

Are there any correlations between children's performance on the naming and the multiple choice tasks ?

- Children's performance on the naming task tended to correlate with their performance on the multiple choice task during the immediate post test. Significant correlations between the two measures were found during the delayed post test.

Are there any correlations between children's performance on the naming and the other comprehension tasks across testing ?

- Children's performance on the naming task was significantly correlated with their performance on the analogy, contrast and definition tasks during the immediate post test. No significant correlations were found during the delayed post test.

5.5 Overall Conclusions and Discussion of Experiment 1

Experiment 1 was designed to extend our understanding of stories as a word learning context by addressing the effects of various linguistic contexts, different cognitive factors (phonological memory, existing vocabulary knowledge) as well as children's age in the acquisition of new words during a single exposure. The results illustrated that no single factor can account for the word learning process although all factors assessed contributed to the child's success. Lastly, the assessment of word learning with multiple measurements substantiated the multifaceted nature of the word learning task. The main findings of Experiment 1 are discussed in the following paragraphs.

A. The older children performed better than the younger ones across tasks and across testing

Experiment 1 demonstrated that there is a general effect of age, which can also be seen in some linguistic conditions in relation to certain lexical tasks. Age related differences have been also documented by Crais, (1987). However, these differences involved older age groups (first, third, fifth grade children and adults).

Nelson (1988) claims that distinct problems are encountered within each age period, therefore, differing processes of acquisition should be expected at each developmental level. Nelson attributed two factors that contributed to the differing processes of acquisition. A strategy factor"- different strategies are employed by different age groups; or a "knowledge based factor"- general knowledge and experience with the world increases with age, and may influence children's ability to perform better. Experiment 1 extends our understanding of these factors by demonstrating that these factors interrelate with the linguistic input the children are exposed to and the type of the lexical tasks word knowledge is assessed.

In particular, it was found that the older children from almost all the types of input (linguistic conditions) performed significantly better than the younger on the majority of tasks. Specifically, they performed better on those tasks which required them to produce accurately the names of the target words, to generate a sentence with the new words, to provide a definition and an analogy for the target words. Previous research has also demonstrated that the older the children they are, the better definitions they can give and the better analogies they can make (Anglin, 1977; Goswami, 1991). A possible explanation for the above findings is that those tasks (naming, sentence generation, definition) required different cognitive prerequisites which were already developed in the older age groups. Thus, those children could benefit more from the various types of information.

Furthermore, there were some tasks (inference, contrast, multiple choice) that the older children performed better than the younger ones but the differences were not significant. The above finding can be explained in two ways. (a) In the case of the multiple choice task the performance of all the age groups reached a ceiling level, implying that either the task was not sensitive enough to tap age group differences or that all the age groups met the requirements of the certain task, (b) In the case of the inference and particularly of the contrast task, it is probable that even the older children had not yet developed the abilities required to succeed on those tasks, therefore age differences were found to be non-significant. However, in some cases the older children seemed to benefit by the type of the input they were exposed to, such as the case of the older children from the contrast condition who performed better on the contrast task than their younger counter parts. It may be the case that the older children had their semantic domain network more fully developed than the younger ones, therefore they could benefit more by the contrast type of linguistic input.

B. Phonological memory played an important role in the lexical acquisition process

Children with high phonological memory performed better across tasks and across testing than children with low phonological memory. The same pattern was found within each linguistic condition. However significant differences were found in some of the conditions. For example in the Lexical contrast condition it was found that the children with high phonological memory performed significantly better than the children with low phonological memory across almost all the tasks. A possible explanation for the above finding is that the children who received information about the target words in a Lexical contrast context, needed also high phonological memory abilities in order to process the given information and successfully answer most of the tasks. Another possible explanation is that the Lexical contrast input made them more sensitive to the phonological differences of the items.

Overall, the effects of the phonological memory for word learning are consistent and extend previous findings by Gathercole and Baddeley (1989, 1990) who have found that vocabulary scores were highly correlated with phonological memory scores at ages four and five. In addition, the present findings demonstrated that in general, phonological memory does not predict understanding of a words' meaning (when understanding is measured by a multiple choice task). It is the case that the development of a phonological representation at some level may be the first step before constructing a more fully developed semantic representation.

C. Children's existing vocabulary tended to play a role in the lexical acquisition process, however, it was not found to be a crucial factor for all the tasks

Experiment 1 demonstrated that children with high vocabulary knowledge performed better than the children with low vocabulary knowledge but the differences were not significant. The role of existing vocabulary knowledge as a significant factor for word learning has been demonstrated by other studies (Elley, 1989; Robbins and Ehri, 1984). The differences between the results of the present Experiment and the other studies could be explained in two ways: (a) Word learning in those studies was assessed using a single measurement, a multiple choice task, while in the present Experiment a variety of tasks were used; (b) The use of the BPVS test as a measure for tapping the prerequisite vocabulary for word learning may be inappropriate. Therefore, the results about the role of the existing vocabulary knowledge for word learning remain inconclusive and need to be further investigated.

D. Children's performance on the word learning tasks differed by the linguistic condition they were assigned to

There was a differential impact of linguistic condition on the measures of acquisition. For example, children in the lexical contrast condition performed better on the naming task than children in the other conditions during the delayed post test. Lexical contrast is characterised by what is called "clearness of referent". Previous studies have found that in contexts where the referent for the new word is obvious, children are easily able to connect the referent and the new word and therefore respond successfully in recognition tasks (Dockrell and Campbell, 1986). Furthermore, children in the Inference condition performed better on the sentence generation task than children in the other conditions for both post tests. Thus, the provision of the specific information in the Inference condition provided the child with the necessary prerequisites to generate novel sentences.

Additionally, children were found to perform better in those tasks where input and assessment were matched. Thus, children in the Contrast condition performed better on the contrast task across testing; children in the Analogy condition performed better on the analogy task across testing and children in the Inference condition also performed better on the inference task than the other groups. These findings suggest an immediate mapping between input and initial inferences. Those findings are in accordance with other research showing that children can effectively use the linguistic context to infer the meaning of the unknown words (Au, 1990; Dickinson, 1984; Dollaghan, 1985). The role of contextual support is also supported by Sternberg and Powell's (1984) theory of word learning from context, where children use certain aspects of the context where the novel word is presented to infer the meaning of a word.

Additionally the above findings indicate that the context where a child encounters a word has a significant impact on the types of semantic representations he can make. Therefore, these data clearly illustrate that a constraints model is not sufficient to explain the development of full lexical representations. The above findings are more in agreement with Nelson's (1988, 1990) interactive functional model. According to the model, children learn new words by interacting with adults linguistically and non-linguistically in a variety of contexts. In such situations the adult is a collaborator who supports inferences and provides feedback.

D. Some of the children's representations reflected a basic level category principle

The children used a basic level word either in order to provide an analogous or different item from the target item or to provide a definition for the target word. This suggests that in those cases the principle of a basic level categorisation (Rosch, 1978) was operating. Furthermore, the Error analysis of the naming task revealed that the use of a basic level word was the most frequent error, when they were asked to name the target items (naming task). It seems that when the children acquire a target word, they choose to make relations with other words which belong at the basic level of the categorisation than the superordinate or the subordinate, as they were defined by Rosch (1978).

E. Children performed better on the immediate than the delayed post test

The measurement of word learning twice (immediate and delayed post test) provided some indication that children's performance was better during the immediate than the delayed post test for some of the tasks (naming, multiple choice and contrast tasks). Different possible explanations can be offered for the above finding. Thus, may be children's memory probably did not help them to remember the relevant aspects of the word's meaning for succeeding on the above tasks a week later. Or may be the information were not encoded in depth because the children did not have enough exposures and they needed more experience.

On the other hand, children's performance on the sentence generation task improved over time. That could probably mean that the children one week later had better organised and accommodated the incoming information from the previous weeks and performed better a week later. It was probably a matter of time.

F. Children's performance varied across tasks

The different measurements used in Experiment 1 tapped in different aspects of word meaning such as the reference, sense and denotation. The results of Experiment 1 indicate that the acquisition of a word's meaning cannot be described by a single task, since a single task cannot reveal in full the different aspects of a word's meaning. For example, children's performance on various tasks (definition, analogy, lexical contrast) indicated their level of understanding of the sense of the word's meaning task which varied across tasks as well as their understanding of the denotation of the word's meaning (multiple choice). Thus, it was found that children performed at a ceiling level on identifying a target item-among four items in the multiple choice task. On the other hand, they performed at a lower level on providing definitions for the target words (including information about their semantic domain) -definition task-and at a much lower level on providing an analogous and a different item (from the same semantic domain as the target word) -in the analogy and lexical contrast task-. Thus, children's acquisition of the target word's sense (the relationship of an item with other items from the same semantic domain) which looks at conceptual structure varied by the type of measurement. In general, the across tasks analysis demonstrated that children's acquisition of the three different aspects of the words' meaning varied by the type of measurement.

Chapter 6:
THE LINK:
RATIONALE FOR EXPERIMENT 2

6.1 What has been found so far?

Experiment 1 investigated the role of different linguistic contexts in relation to child based factors (age, phonological memory, vocabulary learning) in the acquisition of two novel words during a single exposure. The acquisition of the new words was measured using seven different tasks. The main findings of Experiment 1 are summarised in the following paragraphs.

The older children were found to perform better than the younger ones for both post tests. It was also demonstrated that there were different strategies or knowledge based factors which were employed by the older age group children (Nelson, 1988;1990). Thus, there was an interrelationship between the linguistic input and the type of lexical tasks word knowledge was assessed.

Phonological memory was also found to play an important role for word learning. Particularly, it was revealed that the children with high phonological memory performed better across tasks than the children with low phonological memory. The existing vocabulary also tended to play a role for novel word learning. However, the results remain inconclusive, since the differences were not significant. Thus the importance of the existing vocabulary knowledge for word learning needs to be further investigated (see following section).

Experiment 1 also demonstrated that children's performance on the word learning tasks differed by the linguistic condition they were assigned to. In other words, the context where a child encounters a word has a significant impact on the types of inferences he can make. The above findings illustrates that a constraints model is not sufficient to explain the development of full lexical representations. The findings are more in accordance with Nelson's (1988; 1990) claim, that children learn new words by interacting with adults linguistically and non-linguistically at different contexts.

It was also found that children's word knowledge was significantly worse during the delayed than the immediate post test. The above finding indicates that the children could not remember the information given the previous week probably, because they had not encoded the information in much depth since they had only a single exposure to a linguistic input. They had not the opportunity to construct a full representation. Of course there was the case for certain tasks, such as the sentence generation task, where the children performed better one week later (delayed post test), probably because they needed more time to process the incoming information and build an accurate representation of the word's meaning. The above finding raises issues for further research (see following section).

In general, the findings of Experiment 1 are consistent with Adams's and Bullock's (1986) view that there are two necessary conditions (cognitive processes and guidance direct or indirect) for the establishment of a working lexicon. The findings are also in accordance with Nelson's (1988; 1990) interactive functional model for word learning. According to them, the child in order to acquire word forms and match them to the contexts of word uses of the adult, is guided toward the conventional uses by the adult both directly and indirectly. But the child must also rely on his or her own cognitive processes to construct meanings from the language in use.

6.2 Limitations of experiment 1

The obtained results discussed on the previous section are limited in the following ways.

Pre-existing vocabulary knowledge and lexical acquisition

Firstly, the results about the role of children's existing vocabulary knowledge still remain inconclusive since children's performance across tasks did not differ significantly by their existing vocabulary knowledge. It is probable that the critical element taps into particular lexical items and not on general vocabulary knowledge. Therefore, the role of existing vocabulary knowledge needs to be further investigated in order to extend our understanding for the role of the pre-existing vocabulary knowledge for word learning.

The above suggestion is in accordance with other studies (Carey and Bartlett 1978; Heibeck and Markman 1987). Particularly, Carey and Bartlett (1978) found that the children's partial mappings of the novel word "chromium" were highly dependent on the child's preexisting colour lexicon and the name the child used for olive during pretests. Heibeck and Markman (1987) also investigated whether prior lexical knowledge in a given domain predicted how well children learned a new word from that domain. Significant correlations were found for children learning colour words and for children learning texture words but not for children learning shape words.

Therefore, in order to get a better understanding of the role of the children's existing vocabulary for word learning, another test needs to be employed which will measure children's prior lexical knowledge of other words belonging in the same semantic domain as the target words.

Lexical acquisition can be seen as a process over time

The findings of Experiment 1 are limited in describing the lexical acquisition as a process over time. Those findings demonstrated children's word learning in a single assessment (immediate post test). Children's word learning was also investigated one week later (delayed post test). Thus, the delayed post test of Experiment 1, had to do more with remembering than with how children construct a full representation of the word's meaning over time. Therefore, it needs to be further investigated how children construct the representation of a word's meaning over a period of time, by providing them with additional information about the word's meaning every time and by including baseline data.

Exploring the word learning process under more naturalistic situations

In Experiment 1 children were exposed to a single linguistic context in order to explore the possible effects of the linguistic context for word learning. However, that was quite artificial, since children in real life, are exposed to new words in various contexts rather than to a single one. Additionally, the research literature shows that more effective learning is associated with multiple exposures to a word (Stahl and Fairbanks, 1986). Moreover, Senechal (1996) found that children made more gains in vocabulary after three readings of a book than after a single reading. Further experimental evidence coming from the area of reading supports the theory of learning from repeated exposure to various contexts (Sternberg and Powell, 1983; Jenkins, Stein and Wysoski, 1984; Dickinson, 1984; Nagy and Herman, 1985). Nevertheless, most of the evidence comes from samples comprising older children and even students who are able to read. It is important to extend the previous findings to younger subjects and to different linguistic contexts.

Furthermore, non-words were used as target words in Experiment 1. Non-words were chosen so that any learning could be attributed only to the exposure of the children to the experimental situations. However, non-words make the experiment artificial because they do not conform to typical phonological patterns of English. Thus, word learning should also be investigated using real words. The use of a Control group of children could reveal any word learning that could be attributed to other factors except for the experimental situation.

6.3 The Rationale for the Experiment 2

The general aim of Experiment 2 was to overcome the previous limitations as well as to introduce new variables. In that way, the lexical acquisition process was explored in more depth and as it occurs in naturalistic situations. Thus, we will gain a better picture of the lexical acquisition process from listening to stories. Table 6.1 gives an overview of the design of Experiment 1 and an overview of how this will be extended with Experiment 2 by overcoming the previous limitations and taking into account new variables.

Table 6.1 Overview of Experiment 1 & and Experiment 2

Experiment 1	Experiment 2
A. Learning from context (single exposure)	➔ Learning from context (repetitive exposure)
B. Immediate assessment	➔ Over time assessment (representational change)
C. Cognitive factors	➔ Cognitive factors
Existing Vocabulary	➔ Prior lexical knowledge
Phonological Memory	
E. New variables	➔ Characteristics of the target words
	➔Prior knowledge of the lexical items
	➔ Semantic domain of the lexical items

Thus, in order to explore the differential impact of the type of exposure to new lexical items, the children were assigned to different groups that took part in repetitive exposures (three times) to different interventions. There were five groups: The Control group, the Phonological control group, the Ostensive definition, the Lexical contrast and the Definition groups.

The Control group did not take part in any intervention. The Phonological control group was phonologically sensitized (phonological repetition of the new word) in order to test if is it just sensitizing the child to the phonological aspect of the lexical item sufficient for word learning.

The choice of various linguistic contexts such as Ostensive definition, Lexical contrast and Definition was based on recent findings about their various contributions to word learning. The Ostensive definition group was based on recent studies about the relevant impact of the ostensive definition context for the acquisition of novel colour terms. Thus, Gottfried and Tonks (1996) investigated the effects of the ostensive definition for the acquisition of novel colour terms in children aged between 3 and 5 year olds. They found that the ostensive definition was not very helpful for the children since they made the wrong inferences about the colour term. According to Gottfried and Tonks ostensive definition statements ("This is mauve") provide little information about the semantic domain of the novel word. Nevertheless, Experiment 2 will extend the previous research by investigating whether children's exposure to an ostensive definition context and a story context are more sufficient conditions for word learning than a single Ostensive definition context.

The Lexical contrast group followed the linguistic constraint model (see chapter 1) proposed by Clark. There is also evidence coming from various studies (Carey 1978; Dockrell and Campbell, 1986) showing that the children use the principle of contrast to infer the meanings of novel words. In a recent study, Gottfried and Tonks (1996) showed that the use of a corrective linguistic contrast (e.g., see it's not purple; it's mauve) contributes to the acquisition of novel colour terms.

There has also been evidence that older children can learn novel words from a single definition (Dickinson, 1984). Additionally, Gottfried and Tonks (1996) demonstrated that the use of an inclusive statement (e.g., see it's mauve; it's a kind of purple) contributes to the acquisition of novel colour terms in young children. Therefore, Experiment 2 included a Definition group in order to investigate to what extent a definition context can help younger children to acquire the meaning of novel words.

Experiment 2 was also designed to investigate word learning over time in order to describe to what extent lexical representations change. Therefore, children's word knowledge was measured three times over a period of three weeks. Furthermore, in order to explore the effects of pre-existing vocabulary knowledge a different vocabulary test (from the one that was used in Experiment 1) was employed. The new test was designed to measure children's specific vocabulary knowledge (receptive and expressive) of those lexical items which belong in the same semantic domain as the target words. In that way, it will be demonstrated whether prior lexical knowledge (of specific lexical items) contributes to learning novel words from the same semantic domain.

Moreover, as it was mentioned earlier, new variables were also included in Experiment 2. These were children's prior knowledge of the lexical items and the semantic domain of the target words. In order for the child to complete the acquisition process, the different aspects of the word's meaning must be represented in the mind. As it was described in chapter 2, Lyons (1977) proposed a distinction between reference, denotation and sense, as an attempt to characterize meaning. Furthermore, Dockrell and Campbell (1986) proposed that the above distinction can provide a framework for the study of the word meaning acquisition.

Adopting the above proposal, it can be argued that the type of a word's meaning representation the child already has fully or partially developed, will play a role for the later full development of the word's meaning. For example, a child may know the denotation but not the sense of a word's meaning or vice verca. Therefore, Experiment 2 was also designed to investigate to what extent children's prior knowledge (see design section in chapter 7) of the lexical items plays a role for later learning of the same items using various tasks.

The semantic domain of the lexical items was also another new variable included under investigation for Experiment 2. Research has shown that words which belong to different semantic domains result in developmentally distinct patterns of acquisition. This is the case for the natural kind and colour terms. Many studies (Bornstein, 1985; Davidoff, 1991) have found that children acquire the meanings of natural kind terms before they acquire the meanings of colour terms.

Explanations of this difference at the beginning focused on the added salience that object terms have over property names and the extra attention which children devote to object naming. However, Braisby and Dockrell (1999) found that young children are sensitive to the semantic distinction between natural kind and colour terms and that the difference can only be explained on semantic grounds. For example, natural kind and colour terms differ semantically, with natural kind terms having sharper, clearer boundaries and colour terms having unclear or variable boundaries. By corollary, artifacts appear to have sharper cleared boundaries than natural kind terms. Animals and artifacts are two ontological categories which have been used by many studies (see for example Keil, 1989) to explain their strong boundaries as due to their different nature. Experiment 2 will investigate whether there is any difference in the acquisition process of members of these two different categories which arise as a result of the semantic distinction between animals and artifacts. Furthermore, the choice of animals and artifacts was based on the fact that these are domains which children are quite familiar with, either from school or from every day life.

Lastly, since Experiment 1 demonstrated that children's word learning performance varied as a function of the lexical tasks, new tasks will be also included in Experiment 2 in order to extend our understanding of word learning. These tasks are the association task, the story generation task and the short questions task (categorisation questions and world knowledge questions). The association task was designed to explore the way that children associate the target items with other items, as well as to investigate the justifications provided. Thus, the association task will tap on similarity and therefore sense of the word's meaning. Each of the items (target and choice items) was represented pictorially. The selection of the choice items met certain criteria. Half of them were living things - animals and plants - and the other half were non-living things - natural kinds and artifacts - (see diagram in Appendix 6.1). The sentence generation task investigated children's ability to use the new term in an appropriate sentence context. How they referred to the target word and the types of properties and relations provided in the story were also explored. Thus, the sentence generation task was designed to tap not only at the denotation but also sense of the word's meaning.

The short questions task included two sets of questions which were designed to investigate children's understanding of the words' meaning. The first set of questions (*Categorisation questions*) examined children's understanding of possible superordinate relations,-tapped on the sense of the word- for example "Is the ostrich a kind of bird ?". The second set of questions (*World knowledge questions*) examined children's world knowledge, where the objects/animals are commonly found. For example "can we find the ladle in the kitchen?" (For full sets of questions see Appendix 7.5). For each target word nine questions were designed (A set of five, comprised the categorisation questions, while a set of four comprised the world knowledge questions). Each set of questions included one question as a destractor. One correct answer was only available per target word for each one of the sets.

The main **research questions** of Experiment 2 are the following:

1. Is there a differential impact of the type of exposure to new lexical items that the children receive ?
2. Does children's performance improve with increased exposure to the lexical items ?
3. Does the nature of the children's prior knowledge of the lexical items from the same semantic domain influence acquisition?
4. Is the acquisition process influenced by the semantic domain of the lexical items ?
5. To what extent, does the child's prior lexical knowledge influence acquisition?

Chapter 7:
EXPERIMENT 2

7.1 Introduction

The chapter begins by presenting the aims and the research questions of Experiment 2. Then, the methods and the results of Experiment 2 are presented. The Results sections begins with the baseline measures and each one of the post test measures and concludes with between and across tests comparisons (see the organisation of the results at the Results section).

7.2 Aims and Research questions of Experiment 2

Experiment 2 was designed to investigate the effects of child based factors (prior vocabulary knowledge), the nature of the lexicon (semantic domain and prior knowledge of the target words) and the nature of the input (repetitive exposure to different linguistic contexts) for the acquisition of new words. The main research questions of Experiment 2 (as already been presented in the previous chapter) are the following:

1. Is there a differential impact of the type of exposure to new lexical items that the children receive ?
2. Does children's performance improve with increased exposure to the lexical items ?

3. Does the nature of the children's prior knowledge of the lexical items influence acquisition?

5. Is the acquisition process influenced by the semantic domain of the lexical items ?

6. To what extent, does the child's prior lexical knowledge influence acquisition?

7.3 Methods

7.3.1 Participants

Two hundred and fifty children from five primary schools in London were screened for Experiment 2. All the children had to have English as their first language. At the end, one hundred and thirty five-year-old English-speaking children (age range 4 years 10 months to 6 years) were selected to take part in Experiment 2[1] . Sixty five were boys and 65 were girls. Table 7.1 shows the range of age and the mean age (in years and months) of the sample by group of intervention.

Table 7.1 Characteristics of the sample

Groups	Age		Boys	Girls	Total
	Range	Mean			
Control I	4.10 - 6.00	5yrs-5months	13	13	26
Phon. Control	4.10 - 5.11	5yrs-3months	13	13	26
Osten.definition	4.10 - 5.08	5yrs-3months	13	13	26
Lexical contrast	4.11 - 6.00	5yrs-6months	13	13	26
Definition	4.11 - 5.09	5yrs-3months	13	13	26

7.3.2 Design

The Design of Experiment 2 is presented in Table 7.2. Experiment 2 had a mixed within-subjects between-subjects design. The different groups and the prior lexical knowledge (receptive and expressive) were the between-subjects variables, while the semantic domain of the target items, prior knowledge of the target lexical items and time (post tests 1,2,3), were the within-subjects variables.

[1] The rest, 120 children, did not take part in the study because they did not meet the criteria to be included (see design section).

Table 7.2 Design of Experiment 2

Groups	Pre-test	Session 1		Session 2		Session 3	
		Exp.	Ass	Exp.	Ass.	Exp.	Ass.
Control	√	No intervention	-	No intervention	-	Story reading	√
Phonological Control	√	Phonological repetition	-	Phonological repetition	-	Story reading	√
Ostensive definition	√	Ostensive definition	√	Ostensive definition	√	Story reading	√
Lexical contrast	√	Ostensive definition	√	Lexical contrast	√	Story reading	√
Definition	√	Ostensive definition	√	Definition	√	Story reading	√

Exp. = Type of exposure, Ass.= Assessments - = no assessment took place, ✓ = assessment took place

Children were pre-tested on two different measurements: (a) naming task (identifying their baseline expressive vocabulary knowledge and (b) multiple choice task (identifying their baseline receptive vocabulary knowledge).The four target words were also pretested during that screening procedure. To be included in the study children needed to meet the criteria presented in Table 7.3.

Table 7.3 Criteria met by all the children who took part in Experiment 2

	High frequency words	Low frequency words
Naming (production)	Failure (n = 130)	Failure (n=130)
Multiple choice (Comprehension)	Success (n =130)	Failure (n = 130)

This allowed the pattern of acquisition for unknown (low frequency words) and for partially represented lexical items (high frequency words) to be monitored. The operational definition in this Experiment of "partially represented" words is evidence of comprehension but not production, while the operational definition of "unknown words" is no evidence of comprehension or production.

The children were randomly allocated to one of the five following groups: (a) Control group, (b) Phonological control group, (c) Ostensive definition group, (d) Lexical contrast group and (e) Definition group. For the purposes of the present Experiment, the first two groups are called the *Control groups,* while the last three are called the *Experimental groups*.

The interventions took place over a period of three weeks. Immediate assessment took place after each intervention. The Control groups were assessed at the pre-test and post-test 3, while the Experimental groups were assessed on two additional occasions (post-test 1 & 2).

Children's word knowledge was assessed through seven tasks. Assessment took place over three sessions for the experimental groups. The order of presentation of the tasks was the same for all the children across sessions, so that any order effects would be balanced across children. The measurements used are presented in Table 7.4. The naming task was administered before the multiple choice task, in order to prevent any cues for the target words to be provided.

Table 7.4 Post-test measurements of Experiment 2

Measurement	Question
Naming task	*What is this ?*
Multiple choice task	*Show me the x;*
Association task	*What goes best with the x ?*
Short questions task	
-World knowledge questions	*Can we find the x in the y place ?*
-Categorisation questions	*Is the x a kind of y ?*
Contrast task	*Tell me something which is different from the y;*
Definition task	*What do you think an x is ?*
Story generation task	*Make up a story about the x*

7.3.3 Materials

The materials used in the present experiment included the target lexical items, the baseline vocabulary knowledge tests and the post-test measurements. The materials for each measurement are described separately in the following subsections.

The target lexical items

The items were chosen to represent two different semantic domains. Two were animals (ostrich and mole) and the other two were artifacts (ladle and stool). In each domain one item was a high frequency word (mole for animals and stool for artifacts) and the other one was a low frequency word (ostrich for animals and ladle for artifacts). The items were chosen to be of high and low frequency based on Thorndike's index (1944). That index was chosen since it gives the frequency of the words present at different age groups by taking into account their oral vocabulary.

Prior lexical knowledge (naming and comprehension) tests

Those tests were given as measures of baseline vocabulary knowledge (expressive and receptive). They were also used as pre-test for children's knowledge of the target words by measuring the number of accurate and incorrect responses. The screening test was very similar to the one used by Dockrell, Messer, & George, (1997). The order of the words' presentation was randomised. Practice trials were not scored.

Each of the two vocabulary tests had 22 trials and four additional practice trials (see Appendix 7.1). The naming vocabulary test included the same items as the comprehension vocabulary test. The test stimuli belonged to two different semantic categories, animals and artifacts. Eleven of the items were words for animals and eleven of the items were words for artifacts. Ten of the words were of high frequency and twelve of the words were of low frequency. Four out of the twenty two words were the target words used in the study. A laptop computer was used, where the pictures of the items were presented on the screen. A scoring sheet, a paper and a rubber were also used.

Post-test measurements

Naming task: Four different cards presenting the pictures of the target items were used.

Multiple choice task: Four plates were used. On each plate four pictures were presented (see Appendix 7.2). They included a picture of the target word, a semantic foil, a phonological foil and an irrelevant foil.

Association task: Twenty four cards presenting pictures of different items as well as pictures of the target items were used.

Contrast task: Pictures of the four target words as well other pictures (from the association task) were used.

Story generation task: The four pictures of the target words were used.

7.3.4 Procedure

The present section is divided into three parts. The first part presents information about the general testing procedure. In the second part the pre-test and intervention procedures for the Control and Experimental groups are described. In the third section, the procedures for the post-test measures are presented.

7.3.4.1 General testing procedure

All the children were tested by the author. The experimenter was introduced to each class by the class teacher. At the start of each testing session, a few minutes were spent in general conversation with the child, to put him or her at ease. All the tasks were introduced to the child as "games". Each child was assured that this was not a test, and there were no right or wrong answers.

Children were tested in four separate sessions. Sessions were conducted one week apart. Each session lasted from 15 to 20 minutes. Children were taken individually to the quietest available place away from the classroom. As soon as the screening test was completed, the chosen children were assigned randomly to five groups (26 children per group) where each group was exposed to a different combination of linguistic contexts throughout three consecutive sessions. The order of exposure to the different linguistic contexts for Ostensive definition, the Lexical contrast and Definition group was structured in such a way that children were given additional information about the meaning of the word. That was not the case for the Control and the Phonological control groups.

7.3.4.2 Pre-test procedure

Prior lexical knowledge (Naming and Comprehension) test

The pre-test was identical for all the children. A screening test was carried out in order to select the children that would take part in the experiment. The pre-test included the two pre-test measurements. The order of the measures was kept the same for all the children. The baseline (naming) vocabulary knowledge test was conducted first, while the baseline (comprehension) vocabulary knowledge test was conducted second. The order of presentation of the items within the tests had been randomised both for the comprehension and naming task in order to avoid order effects.

In this screening test the children were asked to play a game with the computer. In that game they had to answer as quickly as they could. For the naming task, each child was asked "*What is this?*" (pointing to the target item). For the comprehension task, the experimenter asked the child: "*Show me the x*". All the pictures both for the naming and comprehension test were presented on the computer screen.

7.3.4.3 Intervention procedure

Control groups

There were two groups, the Control group and the Phonological control group. The no intervention Control group received no intervention; they only took part in the last session the story reading. During the story reading session each child was invited to listen to a very nice story, that only a special puppet knew. The Phonological control group during the first two sessions was invited to repeat the word (in the context of a repeating game) in order to be phonologically sensitized. In the third session they were invited to listen to some stories.

The stories that were read to the children, included the following information for the target words: (1) Description/What it can do; (2) Where it can be found; (3) Be Kind of a superordinate category. Also, each word appeared an equal number of times (three) in each story and each target word was presented in relation to other items from the same semantic category.

Experimental groups

The experimental groups were exposed to different linguistic information (Ostensive definition, Lexical contrast, Definitions, Stories). The content of the information given at each of the sessions is presented in Appendix 7.3.

Ostensive definition group

Each child in the Ostensive definition group during the first two sessions were shown a new picture by a puppet and was told "*This is an x*" by pointing to the picture of the target word. In the third session they were invited to listen to stories as before.

Lexical contrast group

The children from the Lexical contrast group during the first session, were shown a new picture by a puppet and were told: "*This is an x*" by pointing to the picture of the target word. In the second session the puppet showed the child three pictures, and asked the child to pass the puppet the target one, while the other two were already-known items from the same semantic category. If the child did that correctly, the puppet gave information about the target item. If the child chose the wrong item the puppet showed the correct one and continued: "*You see the x is different from the y and z because it...* (see Appendix 7.3). During the second session the target words were heard three times, in order to draw the child's attention to the contrast between the words.

Definition group

The children from the Definition group in the first session were shown a new picture by the puppet and were told: "*This is an x*" by pointing to the picture of the target word. In the second session they were given a definition about each of the target words. The puppet showed the target picture to the child and invited the child to a game. The experimenter said that she had some favourite pictures she would like to talk about them saying "*an x is a....* ". In each definition, the target words were heard only once by the children, since it is a powerful condition on it's own. The format of the definitions was the same for all the target words. The information given for each of the target words included the following: (1) What the target word is a kind of; (2) Description of the target item; (3) What it can do/be used for. In the last session the children were invited to listen to stories.

7.3.4.4 Procedure for the Post test Measures

Naming task

Naming of each target word was assessed in the naming task. Each child was told that he/she was going to play a game with the puppet. The child was required to name the target picture. Pictures were presented one at a time. Each time the puppet asked the children: "*What is this?*" (pointing to the target picture). If the child said "*I don't know*" the experimenter asked him/her to think what it was like (see Appendix 7.4 for the recording sheet).

Multiple choice task

The multiple choice task had four trials. Each child was asked to play another game with the puppet. S/he was presented with each of the four plates and s/he was asked "*Show me the x ?*"(the picture of the target word) (see Appendix 7.4 for the recording sheet).

Association task

Twenty choice items were placed on the table in front of the child. The child was told "*We're going to play a game with the puppet*". *The puppet will show you a picture and then you will choose which of those pictures go together with the picture the puppet showed you*". Each time the child was presented with the target picture and then s/he was asked to play the game. As soon as the child had categorised the pictures, the puppet asked the child to justify her/his choice. For example, the child was asked "*why did you put them together* ?" (see Appendix 7.4 for the recording sheet).

Short questions task

The puppet invited each child to play another game. The child had to answer some questions with yes/no or don't know responses. No feedback was given for any of the questions (see Appendix 7.4 for the recording sheet).

Contrast task

In this task the child had to answer four questions, one question per target word. The child was again invited to play a game with the puppet. S/he was asked "*Tell the puppet something which is different from the x* (target word)?" (see Appendix 7.4 for the recording sheet).

Definition task

The child in this task had to answer four questions. S/he was introduced to the puppet who had no idea what certain items (target words) were. The child then was asked "*Could you tell the puppet what an x is, so the puppet knows as well* ?" The child could offer an answer or say don't know (see Appendix 7.4 for the recording sheet).

Story generation task

Each child was invited to play a last game with the puppet. S/he had to make up for the puppet, four different stories about the target words. The experimenter invited the child to tell the puppet these stories. S/he was told "*Now, make up a story about the x (item) and tell it to the puppet ?*" (see Appendix 7.4 for the recording sheet).

7.4 Results of Experiment 2

The results are divided into four sections. The first section considers the *Baseline measures* (baseline vocabulary knowledge test for naming and comprehension). The second section considers the *Production measures* (naming task). The third section considers the *Understanding measures* and is divided into two subsections (the first subsection discusses the *Direct measures* of Understanding. For the present experiment the operational definition of direct measures of understanding refers to the measures which ask about the word knowledge explicitly (multiple choice, short questions task - (a) categorisation questions and (b) world knowledge questions, and definition task) while the second subsection discusses the *Indirect measures* of Understanding. The operational definition of indirect measures of understanding refers to the measures which ask about the word's knowledge implicitly (association task, contrast task, story generation task). The fourth section explores general trends and consider comparisons between measures.

All of the research questions were explored for each post-test measure. Therefore each section of the results considers:

1. Is there a differential impact of the type of exposure to the new lexical items that the children receive ? (Critical differences should occur when the intervention change)
2. Does children's performance improve with increased exposure to the lexical items ?
3. Does the children's prior knowledge of the lexical item(s) influence acquisition?
4. Is the acquisition process influenced by the semantic domain of the lexical items ?
5. To what extent does the child's prior lexical knowledge influence acquisition ?

Preliminary analysis of children's performance of the four words across tasks revealed no significant differences. Therefore, the results from all the words were added up using the 0-1 coding. Relevant statistics will be presented for each one of the questions. In general, non-parametric statistics were applied. Because non-parametric tests are less sensitive to significant differences, I report as significant anything which is <.05 and as a trend anything between >.05 and <.07. All the other differences are described as non-significant. In the cases where the variances among groups were equal (according to Levene test) parametric statistics were used.

7.4.1 The Baseline measures

Scoring criteria of the prior lexical knowledge (naming and comprehension) test

The maximum score a child could get at the naming test was 18. For the comprehension task the maximum score was 18 as well. The target words had been excluded for that analysis as confounding variables. Children's success in the two tests was not found to vary across items.

The scores for the naming and comprehension tests were coded in low level and high level (comprehension and naming) vocabulary. The splitting into high and low was made by examining a stem and leaf plot. For this analysis half of the sample belonged to the high level and the other half belonged to the low level. Low level naming score was given to a child who scored between 1-13, while high level naming was given if the child scored between 14-18 correct responses in the prior lexical knowledge (naming) test. Low comprehension vocabulary was given to a child who scored between 1-16, while high level comprehension was given if the child scored between 17-18 correct responses in the prior lexical knowledge (comprehension) test.

7.4.1.1. Prior lexical knowledge (comprehension, naming) tests

Table 7.5 presents groups' performance on the baseline naming and comprehension vocabulary tests in means and standard deviations. Statistical comparisons between the two baseline measures per group is also presented.

Table 7.5 Children's performance (means and sds) on the baseline measures

	Comprehension		**Naming**			
	Mean	**Sd**	**Mean**	**Sd**	**T**	**Sig.**
Control	16	1.1	12	1.8	12.2	.000
Pho.Control	16.1	1.7	12.3	2.8	11.4	.000
Ostens. Definition	16.5	1.2	11.8	1.9	11.5	.000
Lex. Contrast	15.5	1.5	13	2.4	5.3	.000
Definition	16.8	1.5	13.9	1.7	7.6	.000

Abbreviations: Pho.Control = Phonological control; Ostens.Definition = Ostensive Definition; Lex.Contrast = Lexical Contrast

Children's baseline vocabulary for comprehension was higher than their baseline vocabulary for Naming. That was evident for each of the groups. The statistical comparison (T-test for paired samples) revealed that the differences were significant for each group (see Table 7.5). On the other hand, there were no significant differences between the groups in each test.

7.4.2 The post test measures

7.4.2.1 The Production measures

7.4.2.1.1 Naming Task

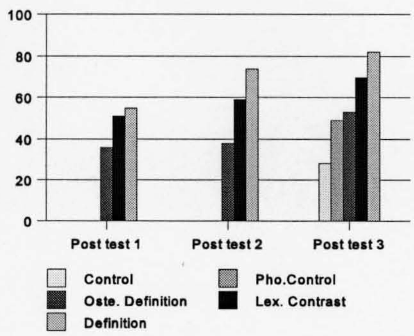
Scoring criteria for the naming task

Each child had to answer four questions. Each response was scored 1 for correct and 0 for incorrect. To be scored correct, the response had to be the accurate production of the target word. Any other response was scored as incorrect. Each child could get a score from 1- 4. An error analysis was also carried out (see in later section).

Analysis

Figure 7.1 below shows the number of correct responses of the different groups across testing. There was a maximum group score of 104.The Control, Phonological control and Ostensive definition group performed at a very low level, while the Lexical contrast and Definition group performed better than the others.

Figure 7.1 Total number of correct responses on the naming task by group across testing



Is there a differential impact of the type of exposure to new lexical items that the children receive in their performance on the naming task?

Three One Way Analyses of Variance (for the three post tests) were carried out to test group differences. Each time, group was the independent variable and score on the naming task was the dependent variable. No significant differences were found for post test 1. Significant differences were found during post test 2 [F(2, 75) = 8.3, p<.000] and post test 3 [F= (4,125) = 13.1, p<.0000]. Table 7.6 presents the means for each group.

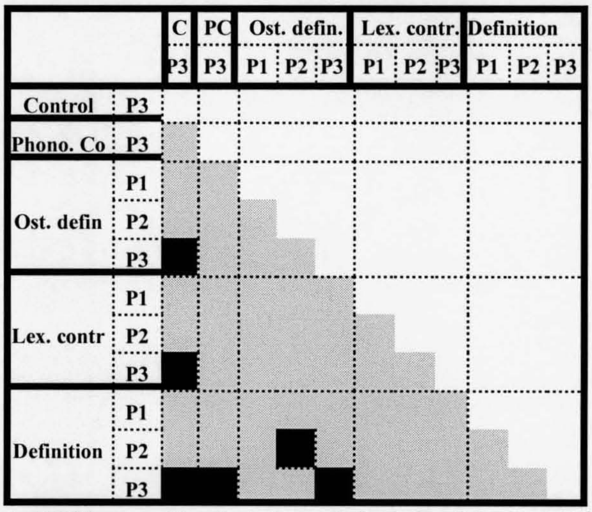
Table 7.6 Children's performance (means and sds) on the naming task by group across testing

	Post test 1		Post test 2		Post test 3	
	Mean	**Sd**	**Mean**	**Sd**	**Mean**	**Sd**
Control					1.08	(1.13)
Pho.Control					1.88	(1.24)
Osten. Definition	1.38	(1.24)	1.46	(1.14)	2.04	(1.11)
Lexi.Contrast	1.96	(1.18)	2.27	(1.25)	2.69	(1.16)
Definition	2.12	(1.28)	2.85	(1.29)	3.15	(.92)

Abbreviations: Pho.Control=Phonological Control; Lexi.Contrast= Lexical Contrast

Post-hoc analysis for post test 2 revealed that the Definition group performed significantly better than the Ostensive definition group. Post-hoc analysis for post test 3 revealed that the Definition group performed significantly better than the Control, Phonological control and the Ostensive definition groups. Furthermore, the Lexical contrast and Ostensive definition group performed significantly better than the Control group. Diagram 7.1 presents the significant differences between the groups.

Diagram 7.1 Significant[1] group differences on the naming task across testing



Abbreviations: C= Control PC/Phono.co=Phonological control; Ost.defin.=Ostensive definition; Lex. contr. Lexical contrast

[1] Dark squares refer to significant differences between the groups, and it was done so that the reader can have a visual picture of the data.

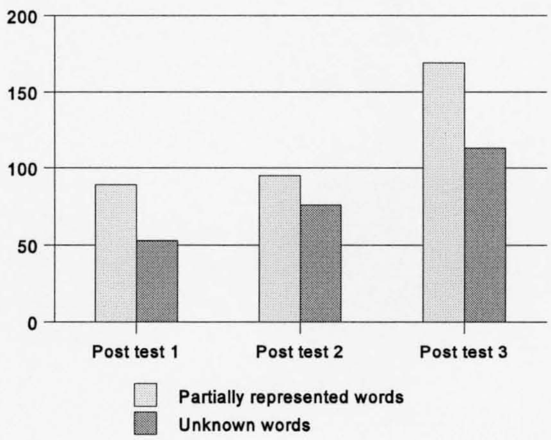
Does children's performance on the naming task improve with increased exposure to the lexical items ?

A Friedman-Two-Way ANOVA was carried out to investigate whether children's performance on the naming task improves with increased exposure to the lexical items. Children's performance improved significantly across testing (X^2=25, df=2, p<.0000). The analysis was repeated separately for each experimental group. All of the groups improved significantly over time [Ostensive definition group (X^2=7.6, df=2, p<.05), Lexical contrast group (X^2=9.3, df=2, p<.05) Definition group (X^2=10.4, df=2, p<.005)].

Does the children's prior knowledge of the lexical items influence their performance on the naming task?

By considering all the children together there were 260 responses for the partially represented items and 260 responses for the unknown items. As Figure 7.2 shows all the children performed better on the naming task if they already possessed a partial representation of the target lexical item.

Figure 7.2 Total number of correct responses on the naming task by children's prior knowledge of the lexical items across testing

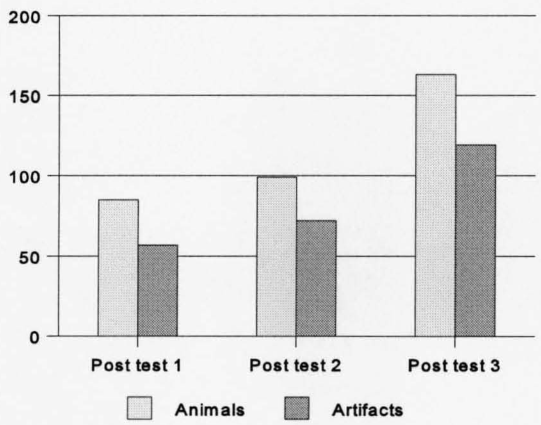


The differences were significant across testing (Wilcoxon test P1: Z=3.7, p<.0005; P2: Z=2.1, p<.05; P3: Z=4.9, p<.0000). The analysis was repeated separately for each experimental group. The same pattern was found for the Lexical contrast (Wilcoxon: Z=2.8, p<.005) and Definition group (Wilcoxon: Z=2.3, p<.05) during Post test 1 as well as for the Control (Wilcoxon: Z=2.9, p<.005), the Phonological control (Wilcoxon: Z=3.2, p<.005) and the Ostensive definition groups (Wilcoxon: Z=1.8, p<.05) during post test 3.

Is children's performance on the naming task influenced by the semantic domain of the lexical items ?

By considering all the children together there were 260 responses for the words describing animals and 260 responses for the words describing artifacts. Figure 7.3 shows that all the children performed better on the naming task if the target word was describing an animal than an artifact. The differences were significant across testing (Wilcoxon: P1: Z=3.5, p<.0005; P2: Z=3.2, p<.005; P3: Z=3.8, p<.0005). The same pattern was also evident in the pre-test (t=9.08, df=129, p<.000).

Figure 7.3 Total number of correct responses on the naming task by semantic domain across testing



The same pattern was also found for the Phonological control group during post test 3 (Wilcoxon: Z=2.7, p<.005) the Lexical contrast (Wilcoxon: P1: Z=3.05, p<.005; P2: Z=3.05, p<.005; P3: Z=3.4, p<.005); and Definition group across testing (Wilcoxon: P1: Z=2.9, p<.005; P2: Z=2.03, p<.05; P3: Z=2.8, p<.005). No significant differences were found for the Control and the Ostensive Definition group. A "floor effect" was evident for those groups.

To what extent does the child's prior lexical knowledge[2] (comprehension and naming) influence performance on the naming task ?

Children with high level naming vocabulary performed significantly better on the naming task than children with low naming vocabulary across testing (Mann-Whitney U: P1: Z=2.1,

[2] Children's prior lexical knowledge was the score they achieved in the pre-test (naming and comprehension) with the target lexical items removed

p<.05; P2: Z= 4.6, p<.0000; P3:Z= 4, p<.0005).The same pattern was found for each group. Significant differences were found for the Lexical contrast (Mann-Whitney U: Z=2.8, p<.005) and the Definition group (Mann-Whitney U: Z= 2.1, p<.05) during post test 2.

Furthermore, children with high level comprehension vocabulary performed better on the naming task than those with low level comprehension vocabulary. The differences were significant for post test 1 (Mann-Whitney U: Z= 2.1, p<.05), while a trend for significance was found for the other post tests. The same pattern was found for each group separately, but significant differences were only found for the Ostensive definition group during post test 3 (Mann-Whitney U: Z=2, p<.05).

Error Analysis

Unsurprisingly the children produced a range of different responses on the naming task. An Error analysis was carried out to identify and quantify the different types of responses in the naming task. The different responses are presented on Table 7.7.

Table 7.7 Error Analysis of children's responses in the naming task

Responses	Example
Don't know	If they did not provide any answer
Irrelevant responses	If irrelevant responses were given
Innovative word	If they provided a made up word
Phonological error	Non-accurate production of the target word, e.g. ostrit for ostrich
Functional properties	Mention of functional properties, e.g. "we sit on it" for the stool
Perceptual properties	What the target item looks like, e.g. "It is brown" for the mole
Basic level word	Use of a basic level word, e.g. bird for ostrich
Superordinate level word	Use of a superordinate word, e.g. "animal for ostrich"
Subordinate level word	Use of a subordinate word, e.g. flamingo for ostrich
Target word	Naming accurately the target word

All the correct responses (target word) were excluded for the Error analysis. The distribution of children's error responses over time was investigated. "*Use of a basic level*" word ranged between 16% and 20.2%, while "*use of superordinate level*" words ranged only between 3.1% and 3.5%. The "*don't know*" responses ranged between 14.4% and 27.9%. Table 7.8 shows the results in detail. Children's performance for all the target words together is presented since their performance did not differ by target item. The impact of different exposures to the distribution of responses was also assessed. The results are presented Appendix 7.5. The same pattern is evident for each group across testing.

Table 7.8 Children's responses in the naming task across testing

	Post test 1		Post test 2		Post test 3	
	%	**n**	**%**	**n**	**%**	**n**
Don't know	27.9	87	16.3	51	14.4	75
Irrelevant responses	0.3	1	0.3	1	0.4	2
Innovative word	1.6	5	0.3	1	1.0	5
Phonological error	7.05	22	8	25	5.1	27
Functional properties	0.3	1	-	-	0.8	4
Perceptual properties	0.6	2	0.3	1	-	-
Basic level word	16.3	51	16	50	20.2	105
Superordinate level word	-	-	3.5	11	3.1	16
Subordinate level word	0.3	1	0.3	1	0.8	4
Target word	45.5	142	54.8	171	54.2	282
N of responses		312		312		520

Key findings from the naming task

Is there a differential impact of the type of exposure to new lexical items that the children receive on their performance on the Naming task?

- No group differences were found during post test 1. During post tests 2 and 3, the Definition group performed significantly better than the Ostensive definition group. During post test 3 also, the Definition group performed significantly better than the Control and Phonological control groups. The Lexical contrast and Ostensive definition groups performed significantly better than the Control and Phonological control groups.

Does children's performance on the naming task improve with increased exposure to the lexical items ?

- The children performed better over time. The pattern was the same for each group.

Does the children's prior knowledge of the lexical items influence their performance on the naming task?

- All the children (across testing) performed better on the naming task if they already possessed a partial representation of the target words. The same was found for the

Lexical contrast and Definition group during post test 1 as well as for the Control and Phonological control groups and the Ostensive definition group during post test 3.

Is children's performance on the naming task influenced by the semantic domain of the lexical items ?

- All the children performed better if the target words described animals than artifacts. The previous finding was true for the Lexical contrast and Definition group across testing as well as for the Phonological control group during post test 3.

To what extent does the child's prior lexical knowledge (Comprehension and Naming) influence performance on the naming task ?

Baseline Naming Vocabulary

- All the children with high level naming vocabulary performed significantly better on the naming task than children with low naming vocabulary across testing. The same pattern was found for each group. Significant differences were found for the Lexical contrast group and the Definition group during post test 2.

Baseline Comprehension Vocabulary

- Children with high level comprehension vocabulary performed better on the naming task than those with low level comprehension vocabulary. Significant differences were found for post test 1.The same pattern was found for each group. Significant differences were found for the Ostensive definition group during post test 3.

Concluding remarks for the naming task

- The above analysis of the naming task indicates that the Definition group performed better than the Control, Phonological control and Ostensive definition groups. The children performed better over time. They also performed better if they already possessed a partial representation of the target word as well as if the target word described animal than artifact. Last, children with high naming vocabulary performed better than children with low naming vocabulary on the naming task.

7.4.2.2 The Understanding measures

The Direct Measures

7.4.2.2.1 Multiple choice task

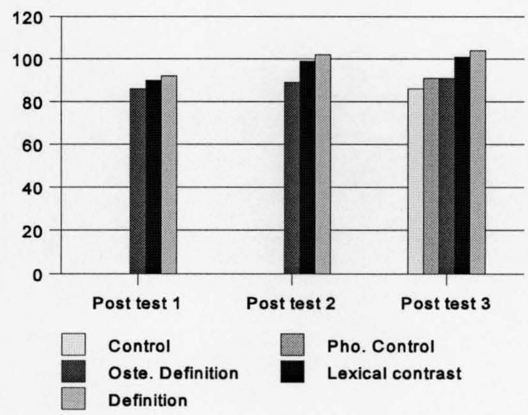
Scoring criteria for the multiple choice task

Each child had to answer four questions. To be scored correct, the response had to be the accurate pointing to the target word on the plate. Any other response (pointing) was scored as incorrect. Each child could get a score from 0- 4. An error analysis was also carried out.

Analysis

Figure 7.4 presents children's performance on the multiple choice task by group across testing. There was a maximum group score of 104. As Figure 7.4 shows, all the groups almost reached a ceiling level.

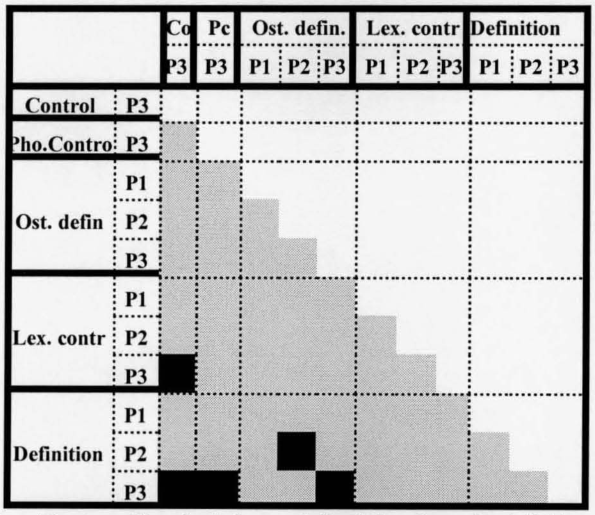
Figure 7.4 Total number of correct responses on the multiple choice task by group across testing



Is there a differential impact of the type of exposure to new lexical items that the children receive on their performance on the multiple choice task ?

Three One Way Analyses of Variance were carried out. Significant differences were found for post test 2 (Kruskall-Wallis, 1-Way ANOVA $X^2=8.8$, df=2, $p<.05$) and post test 3 (Kruskall-Wallis, 1-Way ANOVA $X^2=14.02$, df=4, $p<.05$). Post-hoc analysis revealed no significant differences during post test 1. During post test 2 the Definition group performed significantly better than the Ostensive definition group (Wilcoxon: Z=2.7, p<.05). During post test 3, the Definition group performed significantly better than the Control (Wilcoxon: Z=3.2, p<.005) the Phonological control(Wilcoxon: Z=3.03, p<.005) and the Ostensive definition group (Wilcoxon: Z=2.8, p<.005). The Lexical contrast group performed significantly better than the Control group (Wilcoxon: Z=2.1, p<.05). Diagram 7.2 presents the significant differences between the groups.

Diagram 7.2 Significant group differences in the multiple choice task across testing



Abbreviations: Phono.co=Phonological control; Ost.defin.=Ostensive definition; Lex. contr. Lexical contrast

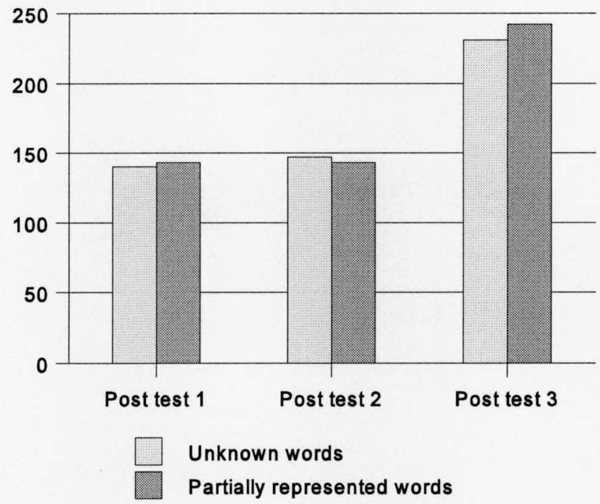
Does children's performance on the Multiple choice task improve with increased exposure to the lexical items?

No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence performance on the multiple choice task ?

Figure 7.5 shows that children's performance on the multiple choice task did not differ by their prior knowledge of the lexical items. Statistical analysis revealed no significant differences.

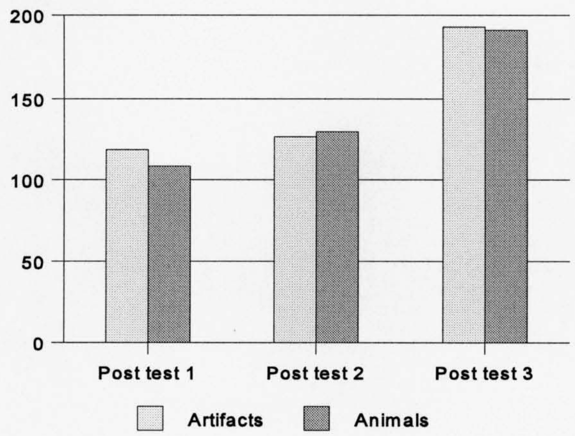
Figure 7.5 Total number of correct responses on the multiple choice task by children's prior knowledge of the lexical items across testing



Is performance on the multiple choice task influenced by the semantic domain of the lexical items?

There was a maximum group score of 260. Figure 7.6 demonstrates that children's performance on the multiple choice task was at the same level for both types of words (animals and artifacts). No significant differences were found.

Figure 7.6 Total number of correct responses on the multiple choice task by semantic domain across testing



The analysis was repeated separately for each group. It was found that during post test 3, the Ostensive definition group performed significantly better on the multiple choice task when the target words described artifacts than animals (Wilcoxon, Z=2.02, p<.05).

Analysis of children's performance of the pre-test (multiple choice test) revealed that all the children performed significantly better on the words describing animals than the words describing artifacts (Wilcoxon: $Z=3.5$, $p<.0005$). When the analysis was repeated separately for each group, the same pattern was found for the Lexical contrast (Wilcoxon: $Z= 2.9$, $p<.005$) and Definition group (Wilcoxon: $Z=2.1$, $p<.05$).

To what extent does the child's prior lexical knowledge (Comprehension and Naming) influence performance on the Multiple choice task?"

Children with high level baseline comprehension vocabulary performed better than children with low level comprehension vocabulary across testing however, the differences were not significant. Separate analysis for each group demonstrated the same pattern, however no significant differences were found.

Furthermore, children with high level baseline naming vocabulary performed significantly better than those with low level baseline naming vocabulary across testing (Mann-Whitney U, P1: $Z=2.4$, $p<.05$; P2: $Z=2.4$, $p<.05$; P3: $Z=2.1$, $p<.05$). Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Definition group during post test 2 (Mann-Whitney U: $Z=1.9$, $p<.05$).

Error Analysis

Responses on the multiple choice task were categorised into five categories which are presented on Table 7.9.

Table 7.9 Responses in the multiple choice task

Responses	Example
Don't know	when they said that they did not know the answer
Phonological error	when they pointed to the phonological foil picture
Semantic error	when they pointed to the semantic foil picture
Irrelevant error	when they pointed to the irrelevant foil picture
Target word	when they pointed to the target word' s picture

The distribution of the responses to the sample was investigated. Table 7.10 presents the results. Children's performance for all the target words together is presented, since their performance did not differ by target item.

Table 7.10	Children's responses in the multiple choice task across testing							
	Pre-test		**Post test 1**		**Post test 2**		**Post test 3**	
	%	**n**	**%**	**n**	**%**	**n**	**%**	**n**
Don't know	25	130	1.9	6	0.1	3	1.9	10
Irrelevant foil	2.1	11	3.8	12	1.6	5	1.3	7
Phonological foil	3.5	18	1.0	3	1.0	3	-	-
Semantic foil	19.4	101	2.6	8	2.2	7	4.4	23
Target	50	260	90.7	283	94.2	294	92.3	480
N of responses		520		312		312		520

Table 7.10 shows that the majority of the children were successful on the multiple choice task. More than 90% of the children (during the post test measurements) correctly identified the target words. Only a small percentage ranging from 0.1% to 1.9% said they did not know. Thus, a ceiling effect was observed. The same analysis was carried out for each one of the groups (see Table in Appendix 7.6). The table in Appendix 7.6 demonstrates the same pattern.

Key findings from the multiple choice task

Is there a differential impact of the type of exposure to new lexical items that the children receive on their performance on the multiple choice task?

- The Definition group performed significantly better than the Ostensive definition group during post test 2 and 3. Moreover, during post test 3 the Definition group performed significantly better than the Control group.

Does children's performance on the Multiple choice improve with increased exposure to the lexical items ?

- No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence performance on the multiple choice task?

- No significant differences on children's performance on the multiple choice task were found by the children's prior knowledge of the lexical items.

Is performance on the multiple choice task influenced by the semantic domain of the lexical items?

- No significant differences were found for the whole sample. On the other hand, the group analysis revealed that the Ostensive definition group performed significantly better on the multiple choice task when the target words described artifacts than animals.

To what extent does the child's prior lexical knowledge (Comprehension and Naming) influence performance on the multiple choice task?

Baseline Comprehension Vocabulary

- Children with high level baseline comprehension vocabulary performed better than children with low level comprehension vocabulary across testing however, the differences were not significant.
- Separate analysis for each group demonstrated the same pattern, however no significant differences were found.

Baseline Naming Vocabulary

- Children with high level baseline naming vocabulary performed significantly better than those with low level baseline naming vocabulary across testing. Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Definition group during post test 2.

Concluding remarks for the multiple choice task

- The analysis of the multiple choice task indicates that the Definition group performed better than the Control, Phonological control, and Ostensive definition groups. No significant differences were found in children's performance across testing. Furthermore, children with high naming vocabulary performed better than children with low naming vocabulary in the Multiple choice task. Overall, no significant differences were found in children's performance by their prior knowledge of the target words and by the semantic domain of the lexical items.

7.4.2.2.2 Definition task

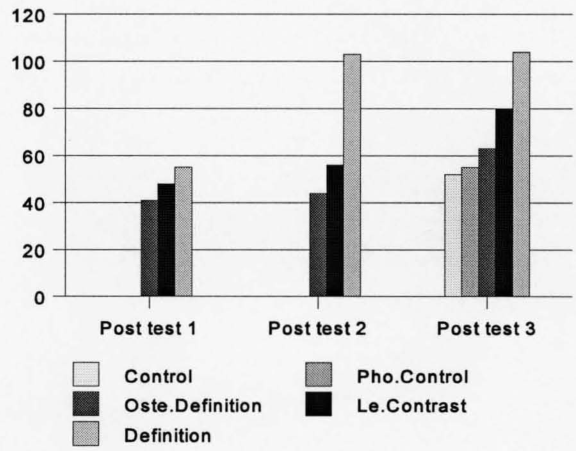
Scoring criteria for the definition task

Each child had to answer four questions. To be scored correct, the response had to be provision of an appropriate definition, and incorrect the provision of an incorrect definition. For the present experiment appropriate definitions were those which included correct information about the meaning of the target words. Thus, definitions which included any correct perceptual and/or semantic an/or functional and/or contextual information about the target words were considered as appropriate. Each child could get a score from 0-4.

Analysis

Figure 7.7 demonstrates how the different groups performed on the definition task across testing. Their performance varies across testing as well as by the type of exposure mainly after post test 2.

Figure 7.7 Total number of correct responses in the definition by group task across testing

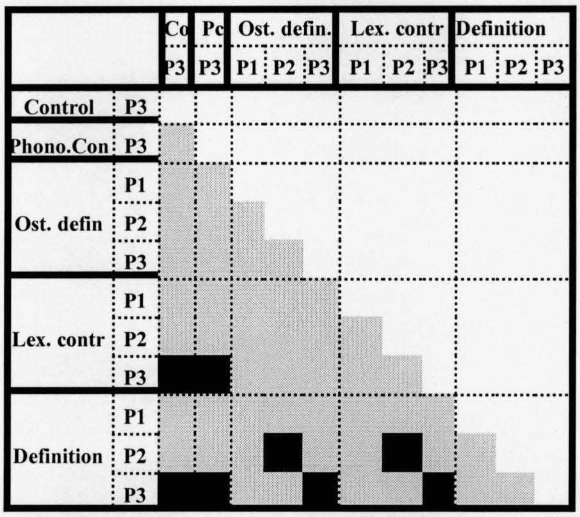


Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of definitions?

The above figure shows that the Definition group performed better that the other groups across testing. The differences were significant for post test 2 (Kruskal-Wallis, X^2 =38.3, df=2, p<.0000) and post test 3 (Kruskal-Wallis, X^2 =37.3, df=4, p<.0000).

Particularly, during post test 2, the Definition group performed significantly better than the Ostensive definition (Wilcoxon: Z=5.8, p<.0005) and the Lexical contrast group (Wilcoxon: Z=5.2, p<.0005). During post test 3 the Definition group provided significantly more definitions than the Control (Wilcoxon: Z=2.4, p<.05) and the Phonological control (Wilcoxon: Z=5.4, p<.0000) and the experimental groups (Wilcoxon: Z=4.6, p<.0000; Z= 4.07, p<.0000). In addition the Lexical contrast group provided significantly more definitions than the Control (Wilcoxon: Z=2.4, p<.05) and the Phonological control group (Wilcoxon: Z=2.4, p<.05). Diagram 7.3 demonstrates the significant differences between the groups.

Diagram 7.3 Significant group differences in the provision of definitions across testing



Abbreviations: Co=Control; Pc/Phono.co=Phonological control; Ost.defin.=Ostensive definition; Lex. contr. Lexical contrast

Does children's provision of definitions increase with increased exposure to the lexical items?

All the children provided significantly more definitions during post test 2 than post test 1 (Wilcoxon: Z=2.1, p<.05), more definitions during post test 3 than post test 2 (Wilcoxon: Z=3.4, p<.0005) and post test 1 (Wilcoxon: Z=3.4, p<.4.8, p<.0000). In addition all the experimental groups provided more definitions over time.

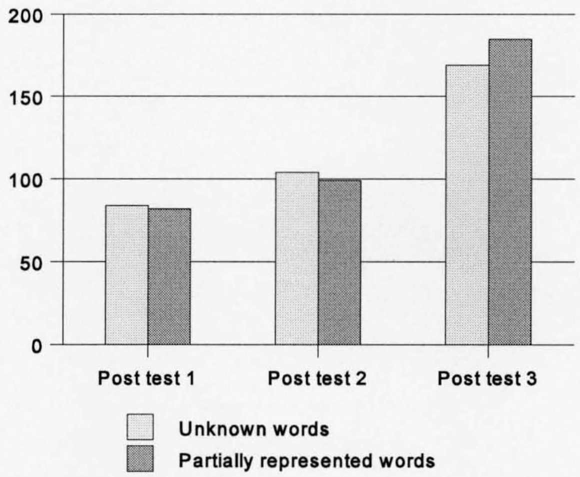
Particularly, the Ostensive definition group during post test 3 provided significantly more definitions than in post test 1 (Wilcoxon: Z=2.2, p<.05) and post test 2 (Wilcoxon: Z=2.4, p<.05). The Lexical contrast group provided significantly more definitions in post test 3 than in post test 1 (Wilcoxon: Z=2.8, p<.005) and Post test 2 (Wilcoxon: Z=2.4, p<.05). The Definition group provided significantly more definitions in post test 2 than in post test 1

(Wilcoxon: Z=3.5, p<.0005). They also provided significantly more definitions in post test 3 than in post test 1 (Wilcoxon: Z=3.5, p<.0005).

Does the children's prior knowledge of the lexical items influence the provision of definitions?

By considering all the children together there were 260 responses for the partially represented and 260 responses for the unknown. Figure 7.8 shows that all the children tended to provide more definitions for the partially represented than the unknown words, however the differences were not significant. Separate analysis for each one of the groups demonstrated the same pattern. Significant differences were found for the Phonological control group (Wilcoxon: Z=2.1, p<.05).

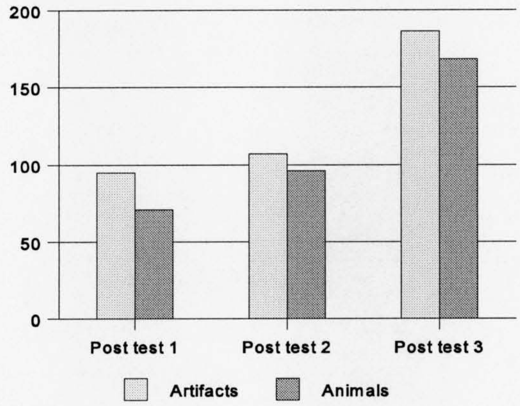
Figure 7.8 Total number of correct responses on the definition task by children's prior knowledge of the lexical items across testing



Is the provision of definitions influenced by the semantic domain of the lexical items?

Figure 7.9 below shows that all the children provided more definitions for the target words describing artifacts than for the animals. The differences were found to be significant for post test 1 (Wilcoxon: Z=2.8, p<.005) and post test 3 (Wilcoxon: Z=2.06, p<.05). The same pattern was found for each group. The differences were found to be significant for the Ostensive definition group during post test 1 (Wilcoxon: Z=2.6, p<.05) and Lexical contrast group across testing (P1: Z=1.9, p<.05; P2: Z=2.03, p<.05; P3: Z=2.1, p<.05).

Figure 7.9 Total number of correct responses on the definition task by semantic domain across testing



To what extent does the child's prior lexical knowledge (Comprehension and Naming) influence the provision of definitions ?

Children with high level baseline comprehension vocabulary provided more definitions than children with low level baseline vocabulary across testing. The differences were significant for post test 2 (Mann-Whitney U: Z=2.4, p<.05). Separate analysis for each group demonstrated the same pattern, however the differences were not significant. In addition, children with high level of baseline naming vocabulary provided more definitions than children with low level baseline naming vocabulary across testing. The differences were found to be significant for post test 2 (Mann-Whitney U: Z=3.8, p<.0005) and post test 3 (Mann-Whitney U: Z=3.05, p<.005). Separate analysis for each group demonstrated the same pattern, however, the differences were not significant.

Qualitative analysis

Children's definitions focused on a variety of properties about the target referents which are presented in Table 7.11 below table.

Table 7.11 Types of properties mentioned in children's definitions

Properties	Example
Descriptive properties	e.g. for the ostrich "it has flat head and long neck"
Semantic properties	e.g "Ostrich is a bird"
Functional properties	e.g. for the ladle "to put soup in the bowl"; for the ostrich " it runs very fast"
Contextual properties	e.g."the mole lives underground"

The distribution of these properties in children's definitions across testing is presented in Figure 7.10. Children's performance for all the target words together is presented, since their performance did not differ by the target item

Figure 7.10 Total number of properties mentioned on the definition task across testing

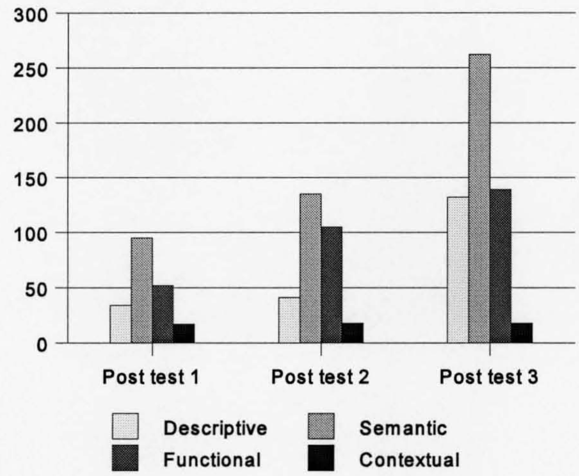
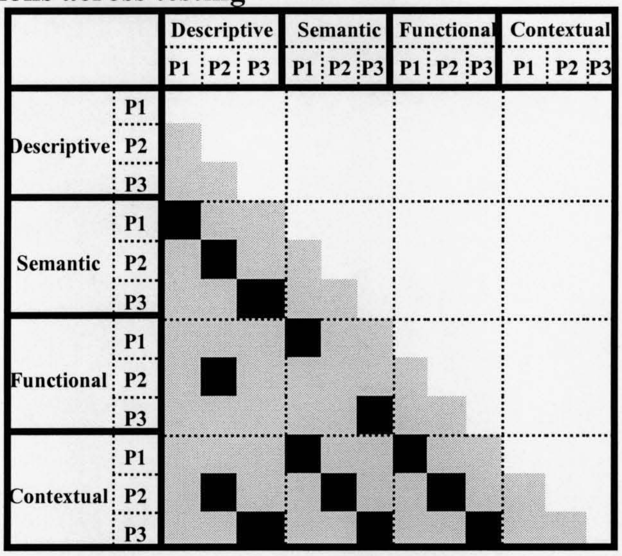


Figure 7.10 demonstrates that the "*semantic properties*" were mainly mentioned in children's definitions. A series of Friedman Two-Way Anovas revealed significant differences among the properties across testing (P1: $X^2 = 27.4$, df=3, p<.000; P2: $X^2 = 50.2$, df=3, p<.000 P3: $X^2 = 112.3$, df=3, p<.000). Particularly, during post test 1 "*semantic*" properties were mentioned significantly more times than "*descriptive*" (Wilcoxon: Z=3.7, p<.0005), "*functional*" (Wilcoxon: Z=2.2, p<.05) and "*contextual*" properties (Wilcoxon: Z=5.06, p<.0000). "*Functional*" properties were also mentioned significantly more than "*contextual*" properties (Wilcoxon: Z=3.2, p<.005). During post test 2 "*semantic*" properties were mentioned significantly more times than "*descriptive*" (Wilcoxon: Z=5.2, p<.0000) and "*contextual*" properties (Wilcoxon: Z=5.9, p<.0000). In addition "*functional*" properties were mentioned significantly more than descriptive (Wilcoxon: Z=4.4, p<.0009) and "*contextual*" properties (Wilcoxon: Z=5.2, p<.0000).

During post test 3 "*semantic*" properties were mentioned significantly more than "*descriptive*" (Wilcoxon: Z=5.8, p<.0000), "*functional*" (Wilcoxon: Z=5.1, p<.0000) and "*contextual*" properties (Wilcoxon: Z=8.1, p<.0000). "*Descriptive*" and "*functional*" properties were also mentioned significantly more times than "*contextual*" properties

(Wilcoxon: Z=7.6, p<.0000 and Z=6.3, p<.0000 respectively). Diagram 7.4 gives a graphical representation of the previous significant differences between the properties.

Diagram 7.4 Significant group differences among the properties mentioned in the definitions across testing



Analysis of the Descriptive properties

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of descriptive properties?

No significant differences were found for post test 1. Significant differences were found for post test 2 (Kruskall-Wallis 1 Way-Anova: $X^2 = 31.2$, df= 2 p<.0005) and post test 3 ($X^2 = 26.6$, df= 4, p<.0000). During post test 2, "*descriptive*" properties were used significantly more by the Definition group than the Ostensive definition (Wilcoxon: Z = 4.1, p<.0005) and the Lexical contrast group (Wilcoxon: Z =4.4, p<.0005). During post test 3, "*descriptive*" properties were used significantly more by the Definition than the Control (Wilcoxon: Z=3.5, p<.0005) the Phonological control group (Wilcoxon: Z=4.3, p<.0000) and the Ostensive definition group (Wilcoxon: Z=3.5, p<.0005). In addition, descriptive properties were used significantly more by the Lexical contrast than the Control (Wilcoxon: Z=3.5, p<.0005) and Phonological control group (Wilcoxon: Z= 4.3, p<.0000).

Does children's provision of descriptive properties increase with increased exposure to the lexical items?

The number of "*descriptive*" properties provided during post test 3 was significantly higher than in post test 1 (Wilcoxon: $Z= 5.4$, $p<.0000$) and post test 2 (Wilcoxon: $Z=4.8$, $p<.0000$). Separate analysis for each group revealed that the Ostensive definition group provided significantly more "*descriptive*" properties in post test 3 than in post test 2 (Wilcoxon: $Z=3.00$, $p<.005$). The Lexical contrast group provided significantly more "*descriptive*" properties in post test 3 than in post test 1 (Wilcoxon: $Z=3.9$, $p<.0005$) and post test 2 (Wilcoxon: $Z=4.1$, $p<.0000$). The Definition group during post test 2 provided significantly less "*descriptive*" properties in post test 1 than in post test 2 (Wilcoxon: $Z=3.2$, $p<.005$) and post test 3 (Wilcoxon: $Z=3.7$, $p<.0005$).

Does the children's prior knowledge of the lexical items influence the provision of descriptive properties?

All the children provided more "*descriptive*" properties for the partially represented than for the unknown words. Significant differences were found for post test 2 (Wilcoxon: $Z=2.3$, $p<.05$). Separate analysis for each group revealed the same pattern. Significant differences were found for the Definition group during post test 2 (Wilcoxon: $Z= 2.04$, $p<.05$) and post test 3 (Wilcoxon: $Z=2.03$, $p<.05$).

Is the provision of descriptive properties influenced by the semantic domain of the lexical items?

The children provided significantly more "*descriptive*" properties for the words describing animals than for the words describing artifacts across testing (Wilcoxon, P1: $Z=3.2$, $p<.005$; P2: $Z=2.4$, $p<.05$; P3: $Z=2.5$, $p<.05$). Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Ostensive definition group during post test 1 (Wilcoxon: $Z=2.02$, $p<.05$), the Lexical contrast group during post test 3 (Wilcoxon: $Z=2.02$, $p<.05$) and the Definition group across testing (Wilcoxon, P1: $Z=2.02$, $p<.05$; P2: $Z=2.8$, $p<.005$; P3: $Z=2.5$, $p<.05$).

Analysis of the Semantic properties

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of semantic properties?

No significant differences were found for post test 1, while significant differences were found for post test 2 [$F(2,75)= 8.1$, $p<.005$] and post test 3 (Kruskal-Wallis 1-Way Anova: $X^2 = 24.7$, df=4, $p<.0005$). Post hoc analysis for post test 2 revealed that the Definition group used significantly more semantic properties than the Ostensive definition and Lexical contrast group. During post test 3 the Definition group used significantly more semantic properties than the Control (Wilcoxon: $Z=4.07$, $p<.0005$) the Phonological control group (Wilcoxon: $Z=4.6$, $p<.0005$), and the experimental groups (Wilcoxon: $Z= 3.04$, $p<.005$; $Z=3.5$, $p<.0005$).

Does children's provision of semantic properties increase with increased exposure to the lexical items ?

All the children provided significantly more "*semantic*" properties in their definitions during post test 3 than post test 1 (Wilcoxon: $Z=4.8$, $p<.0000$) and post test 2 (Wilcoxon: $Z=3.9$, $p<.0005$).They also provided significantly more semantic properties during post test 2 than post test 1 (Wilcoxon: $Z=2.7$, $p<.005$). Separate analysis for each experimental group revealed the same pattern. Particularly the Ostensive definition group provided significantly more "*semantic*" properties during post test 3 than post test 1 (Wilcoxon: $Z=2.4$, $p<.05$) and post test 2 (Wilcoxon: $Z=2.8$, $p<.005$). The Lexical contrast group provided significantly more "*semantic*" properties during post test 3 than post test 1 (Wilcoxon: $Z=2.2$, $p<.05$). The Definition group provided significantly more "*semantic*" properties during post test 3 than post test 1 (Wilcoxon: $Z=3.7$, $p<.0005$) and post test 2 (Wilcoxon: $Z=3.05$, $p<.005$) and significantly more "*semantic*" properties during post test 2 than post test 1 (Wilcoxon: $Z=2.6$, $p<.05$).

Does the children's prior knowledge of the lexical items influence the provision of semantic properties ?

No significant differences were found by the nature of the children's prior knowledge of the lexical items.

Is the provision of semantic properties influenced by the semantic domain of the lexical items?

The children provided more "*semantic*" properties for the words describing artifacts than for the words describing animals across testing, however the differences were not significant. The same pattern was found for each group.

Analysis of the Functional properties

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of functional properties?

Three One Way Anovas were carried out. Each time group was the independent variable and the number of "*functional*" properties provided in post test 1,2 and 3 the dependent variable. No significant differences were found for post test 1, while, significant differences were found for post test 2 (Kruskall-Wallis 1-Way- Anova: $X^2 = 34.5$, df=2, p<.0005) and post test 3 (Kruskall-Wallis 1-Way- Anova: $X^2 = 47.1$, df=4, p<.0000).

Particularly, during post test 2 the Definition group provided significantly more "*functional*" properties than the Ostensive definition (Wilcoxon: Z=4.85, p<.0000) and Lexical contrast group (Wilcoxon: Z=5.05, p<.0000). During post test 3 the Definition group provided significantly more "*functional*" properties than the Control (Wilcoxon: Z = 5.8, p<.0005) the Phonological control (Wilcoxon: Z =5.5, p<.0005), the Ostensive definition (Wilcoxon: Z= 4.08, p<.0005) and the Lexical contrast group (Wilcoxon: Z = 4.8, p<.0005). No significant differences were found between the Control and the Phonological control group across testing.

Does children's provision of functional properties increase with increased exposure to the lexical items?

All the children provided significantly fewer "*functional*" properties during post test 1 than post test 2 (Wilcoxon: Z=3.2, p<.0005) and post test 3 (Wilcoxon: Z=3.8, p<.0005). Separate analysis per group revealed the same pattern. Significant differences were found for the Definition group which provided significantly more "*functional*" properties during post test 2 than post test 1 (Wilcoxon:Z=4.2, p<.0000).

Does the children's prior knowledge of the lexical items influence the provision of functional properties ?

No significant differences were found by the children's prior knowledge of the lexical items.

Is the provision of functional properties influenced by the semantic domain of the lexical items?

The children provided significantly more "*functional*" properties for the words describing animals than for the words describing artifacts across testing (Wilcoxon, P1: Z=2,8, p<.005; P2: Z=4.7, p<0000; P3: Z=5.4, p<.0000). Separate analysis for each group revealed the same pattern. However, significant differences were found for the Lexical contrast group during post test 3 (Wilcoxon: Z=2.02, p<.05) and the Definition group during post test 2 (Wilcoxon: Z=4.1, p<.0000) and post test 3 (Wilcoxon: Z=4.3, p<.0000).

Analysis of the Contextual properties

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of contextual properties?

No significant differences were found for post test 1 and post test 2, while significant differences were found for post test 3 (Kruskall-Wallis 1-Way- Anova: $X^2 = 9.9$, df = 4, p<.05). Particularly, the Lexical contrast group provided significantly more "*contextual*" properties than the Phonological control group (Wilcoxon:Z=2.2, p<.05) Also, the Definition group provided more "*contextual*" properties than the Lexical contrast group (Wilcoxon: Z=2.2, p<.05).

Does children's provision of contextual properties increase with increased exposure to the lexical items ?

No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence the provision of contextual properties?

No significant differences were found by the nature of the children's prior knowledge of the lexical items.

Is the provision of contextual properties influenced by the semantic domain of the lexical items?

Children provided more "*contextual*" properties for the words describing animals than for those describing artifacts across testing. The differences were found to be significant during post test 2 (Wilcoxon: $Z=2.1$, $p<.05$). The same pattern was found for each group, however, the differences were significant for the Lexical contrast group during post test 1 (Wilcoxon: $Z=2.02$, $p<.05$) and the Definition group during post test 2 (Wilcoxon: $Z=2.3$, $p<.05$).

Key findings from the definition task

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of definitions ?

- The provision of definitions differed significantly by group during post test 2 and 3. During post test 2, the Definition group performed significantly better than the Ostensive definition and Lexical contrast group. During post test 3 the Definition group provided significantly more definitions than the other groups. In addition the Lexical contrast group provided significantly more definitions than the Control and Phonological Control group.

Does children's provision of definitions increase with increased exposure to the lexical items?

- All the children provided significantly more definitions during post test 2 than post test 1 and more definitions during post test 3 than post test 2 and post test 1.
- All the experimental groups provided significantly more definitions over time.

Does the children's prior knowledge of the lexical items influence the provision of definitions?

- All the children tended to provide more definitions for the partially represented than the unknown words, however the differences were not significant. The previous pattern was statistically significant for the Phonological Control group.

Is the provision of definitions influenced by the semantic domain of the lexical items?

- All the children provided significantly more definitions for the target words describing artifacts than for the words describing animals in post test 1 and post test 3.
- Each group demonstrated the same pattern. Significant differences were found for the Ostensive definition group during post test 1 and Lexical contrast group across testing.

To what extent does the child's prior lexical knowledge (Comprehension and Naming) influence the provision of definitions?

Baseline Comprehension vocabulary

- Children with high level baseline comprehension vocabulary provided more definitions than children with low level baseline vocabulary across testing. The differences were significant for post test 2. Separate analysis for each group demonstrated the same pattern, however the differences were not significant.

Baseline Naming Vocabulary

- Children with high level of baseline naming vocabulary provided more definitions than children with low level baseline naming vocabulary across testing. The differences were found to be significant for post test 2 and post test 3. Separate analysis for each group demonstrated the same pattern however, the differences were not significant.

Analysis of the Definitions

- Children's definitions focused mainly on the descriptive, semantic, functional and contextual properties.

Descriptive properties:

Is there a differential impact of the type of exposure to new lexical items that the children receive to the provision of descriptive properties?

- No significant differences were found for post test 1, while significant differences were found for post test 2 and 3.
- During post test 2, "*descriptive*" properties were used significantly more by the Definition than the Ostensive definition and the Lexical contrast group. During post

test 3 descriptive properties were used significantly more by the Definition and Lexical contrast group than the Control and Phonological Control. In addition, the Definition group used significantly more "*descriptive*" properties than the Ostensive definition group.

Does children's provision of descriptive properties increase with increased exposure to the lexical items ?

- The children provided significantly more descriptive properties over time. The same pattern was found for each experimental group over time.

Does the children's prior knowledge of the lexical items influence the provision of descriptive properties ?

- All the children provided more "*descriptive*" properties for the partially represented than for the unknown words. Significant differences were found for post test 2.
- Separate analysis for each group revealed the same pattern. Significant differences were found for the Definition group during post test 2 and post test 3.

Is the provision of descriptive properties influenced by the semantic domain of the lexical items?

- The children provided significantly more descriptive properties for the words describing animals than for the words describing artifacts across testing.
- Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Ostensive definition group during post test 1, the Lexical contrast group during post test 3 and the Definition group across testing.

Semantic properties:

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of semantic properties?

- No significant differences were found for post test 1, while significant differences were found for post test 2 and post test 3. Post hoc analysis of post test 2 revealed that the Definition group used significantly more "*semantic*" properties than the other experimental groups. During post test 3 the Definition group used significantly more "*semantic*" properties than all the other groups.

Does children's provision of semantic properties increase with increased exposure to the lexical items?

- All the children provided significantly more "*semantic*" than other properties in their definitions across testing. The same pattern was evident for each experimental group.

Does the children's prior knowledge of the lexical items influence the provision of semantic properties?

- No significant differences were found by the children's prior knowledge of the lexical items.

Is the provision of semantic properties influenced by the semantic domain of the lexical items?

- The children provided more "*semantic*" properties for the words describing artifacts than for the words describing animals across testing, however the differences were not significant. The same pattern was found for each group.

Functional properties:

Is there a differential impact of the type of exposure to new lexical items that the children receive to the provision of functional properties ?

- No significant differences were found for post test 1, while, significant differences were found for post test 2 and post test 3. During post test 2 the Definition group provided significantly more "*functional*" properties than the Ostensive definition and Lexical contrast group. During post test 3 the Definition group provided significantly more "*functional*" properties than the other groups.

Does children's provision of functional properties increase with increased exposure to the lexical items?

- All the children provided significantly more "*functional*" properties during post test 2 and 3 than post test 1.
- Separate analysis per group revealed the same pattern. Significant differences were found for the Definition group.

Does the children's prior knowledge of the lexical items influence the provision of functional properties ?

- No significant differences were found by the children's prior knowledge of the lexical items.

Is the provision of functional properties influenced by the semantic domain of the lexical items?

- The children provided significantly more "*functional*" properties for the words describing animals than for the words describing artifacts across testing.
- Separate analysis for each group revealed the same pattern. However, significant differences were found for the Lexical contrast group during post test 3 and the Definition group during post test 2 and post test 3.

Contextual properties:

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of contextual properties?

- During post test 3 the Lexical contrast group provided significantly more "*contextual*" properties than the Phonological control group. Also, the Definition group provided more "*contextual*" properties than the Lexical contrast group.

Does children's provision of contextual properties increase with increased exposure to the lexical items ?

- No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence the provision of contextual properties ?

- No significant differences were found by the children's prior knowledge of the lexical items.

Is the provision of contextual properties influenced by the semantic domain of the lexical items?

Children provided more "*contextual*" properties for the words describing animals than for those describing artifacts across testing. The differences were found to be significant for post test 2. The same pattern was found for each group. The differences were significant for the Lexical contrast group during post test 1 and the Definition group during post test 2.

Concluding remarks for the Definition task

- The above analysis of the Definition task indicates that the Definition group performed better than the other groups and overall the children performed better over time. The children tended to provide more definitions for the partially represented than the unknown words as well as for the artifacts than the animals. Moreover, the children with high comprehension and naming vocabulary provided more definitions than the children with low comprehension and naming vocabulary.

- A qualitative analysis of the Definitions revealed that the children focused on different properties in their definitions of the target words such as "*descriptive*", "*semantic*", "*functional*" and "*contextual*". Analysis of each type of property revealed that the Definition group always performed better than the other groups and that the children from that group provided more "*descriptive*", "*semantic*" and "*functional*" properties over time than the children from the other groups. Furthermore, all the children provided more "*descriptive*" properties for the partially represented than the unknown words. They also provided more "*descriptive*" and "*contextual*" properties for the words describing animals than artifacts, and more "*semantic*" properties for the words describing artifacts than animals.

7.4.2.2.3 Short questions task

Scoring criteria for the Short questions task

Each child had to answer four questions for each set of questions (categorisation and world knowledge questions). Each child could get a score from 0- 4 for each set of questions.

Analysis

The short questions task included two types of questions. The "*world knowledge*" and the "*categorisation*" questions. By considering all the children together there were 312 correct responses for post test 1 and 2 and 520 correct responses for post test 3. Children's performance in both types of questions is presented in Table 7.12 below.

Table 7.12 Children's performance in the short questions task across testing

Questions	**Post test 1**		**Post test 2**		**Post test 3**	
	%	**n**	**%**	**n**	**%**	**n**
Categorisation	18.5	58	36.2	113	36.5	190
World knowledge	69.5	217	75.3	235	84.2	438

As the above table shows the children performed better in the "*world knowledge*" questions than in the "*categorisation*" questions over time. However, regarding the results in the above table it was scored as correct if the children answered "yes" to the questions they were supposed to. For example, if they answered "yes" to the questions "*Can we find the ostrich in the jungle?*" and "*Can we find the mole in the countryside ?*" and "*Can we find the ladle in the kitchen?*" and "*Can we find the ladle in the kitchen?*" and "*Can we find the stool in the kitchen ?*", they achieved a total score of 4 which was the best score.

Nevertheless, with this type of analysis it is unclear how accurate children's responses were. For example, we don't know if they also said "yes" to the other questions. If this is the case, then the previous results are questionable. Therefore another way of coding their responses was developed. If the children said "yes" as an answer to all of the questions, then that was coded as a *"fixed response pattern"*, while if their response differentiated (by saying "yes" only to the appropriate question for each target word and "no" to the rest) that was coded as a *"correct choice pattern"*. Thus, a further analysis was carried out. Performance in each target word was coded as showing any of the two above patterns. Then a total score for all of the words was calculated. Each group could get a maximum score of 104 for each post test. Figures 7.11 and 7.12 present the results for both sets of questions.

Figure 7.11 Total number of correct responses in the "categorisation questions" by group across testing

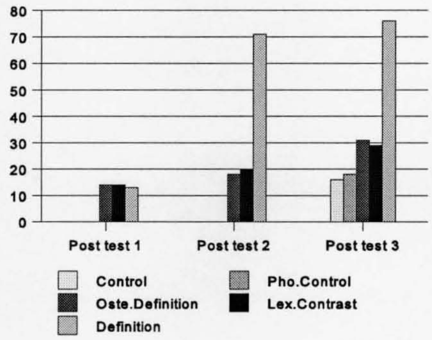
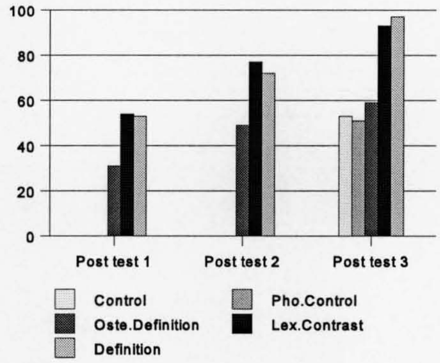


Figure 7.12 Total number of correct responses in the "world knowledge" questions by group across testing



The previous figures show the same pattern as that shown in Table 7.11, nevertheless, to a lower degree. In addition, comparison between the two sets of questions revealed that the children performed significantly better in the "*world knowledge*" than the "*categorisation*" questions across testing (Wilcoxon, P1: Z=5.8, p<.0000; P2: Z= 4.7, p<.0000; P3: Z=8.1, p<.0000).

Is there a differential impact of the type of exposure to new lexical items that the children receive on their performance in the short questions task ?

Categorisation questions

Three separate One Way Analyses of Variance were carried out with group as the independent variable and score in the categorisation questions as the dependent variables.

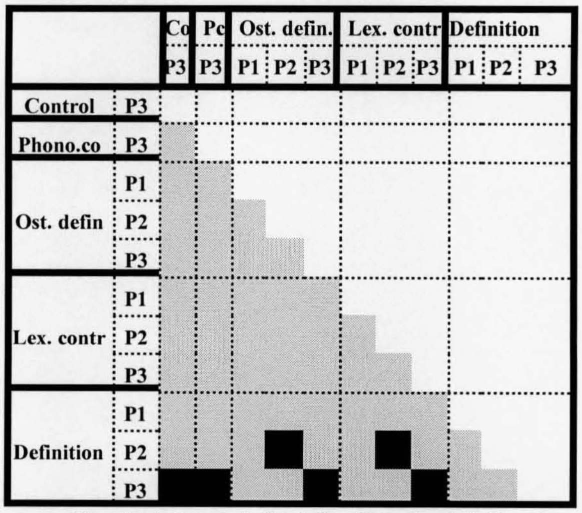
Significant differences were found for post test 2 [F(2,75)=30.5, p<.0000] and post test 3 [F(4,125)=19.02, p<.0000] but not for post test 1. Table 7.13 presents the means by group across testing.

Table 7.13 Performance (means and sds) in the "categorisation questions" by group across testing

	Post test 1		Post test 2		Post test 3	
	Mean	**(sd)**	**Mean**	**(sd)**	**Mean**	**(sd)**
Control					.62	(.98)
Pho.Control					.69	(.93)
Ostensive definition	.54	(.76)	.69	(97)	1.19	(1.10)
Lexical Contrast	.54	(.71)	.77	(.95)	1.12	(1.24)
Definition	.50	(.76)	2.73	(1.25)	2.92	(1.20)

Post-hoc analysis for post test 2 revealed that the Definition group performed significantly better than the Ostensive definition and Lexical contrast group. Post-hoc analysis for post test 3 revealed that the Definition group performed significantly better than all the other groups. Diagram 7.5 demonstrates the significant differences between the groups across testing.

Diagram 7.5 Significant group differences in the "categorisation questions" across testing

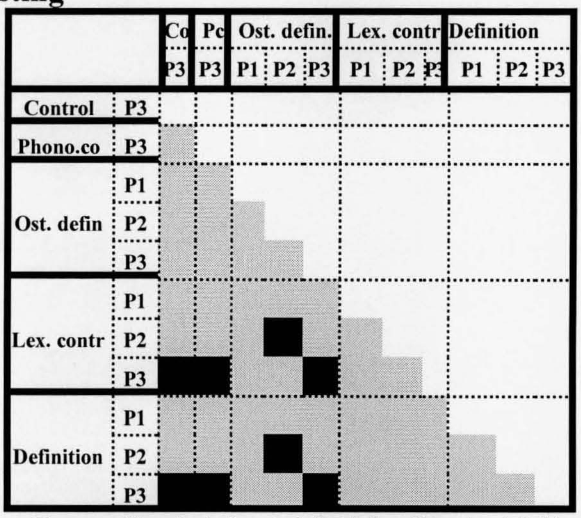


Abbreviations: Co=Control; Pc/Phono.co=Phonological control; Ost.defin.=Ostensive definition; Lex. contr. Lexical contrast

Word knowledge questions

Three Kruskal-Wallis 1-Way Anovas were carried out with group as the independent factor and score on the questions as the dependent factor. Children's performance in the "*world* *knowledge*" questions was found to differ significantly during post test 2 (Kruskal-Wallis: $X^2 = 13.07$, df=2, p<.005) and post test 3 (Kruskal-Wallis: $X^2 = 65.2$, df= 4, p<.0000). Post hoc analysis revealed that the Lexical contrast group performed significantly better than the Ostensive definition group during post test 2 (Wilcoxon: Z=3.2, p<.005). Moreover, the Definition group performed significantly better than the Ostensive definition group during post test 2 (Wilcoxon: Z=2.7, p<.05). During post test 3 the Lexical contrast group performed significantly better than the Control (Wilcoxon: Z=5.2, p<.0000), the Phonological control (Wilcoxon: Z=5.3, p<.0000) and the Ostensive definition group (Wilcoxon: Z=4.3, p<.0000). The Definition group also performed significantly better than the Control (Wilcoxon: Z=5.5, p<.0000) the Phonological control (Wilcoxon:Z=5.7, p<.0000) and the Ostensive definition group (Wilcoxon: Z=4.9, p<.0000). Diagram 7.6 presents the significant differences between the groups.

Diagram 7.6 Significant group differences in the "world knowledge questions" by group across testing



Abbreviations: Phono.co=Phonological control; Ost.defin.=Ostensive definition; Lex. contr. Lexical contrast

Does children's performance on the short questions improve with increased exposure to the lexical items?

Categorisation questions

Children's performance on the categorisation questions improved significantly over time (Friedman Two Way Anova: $X^2 = 31.1$, df=2, p<.05). The same pattern was evident for the Ostensive definition group (Friedman Two Way Anova: $X^2 = 7.7$, df=2, p<.05), and the Definition group (Friedman Two Way Anova: $X^2 = 31.4$, df=2, p<.0000).

World knowledge questions

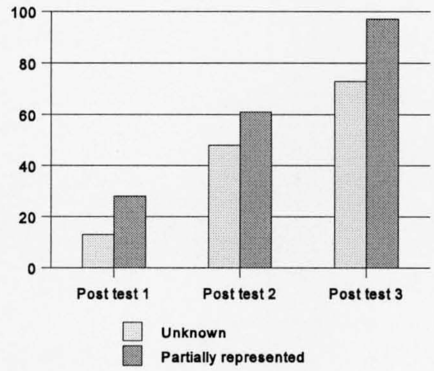
Children's success on the world knowledge questions increased significantly over time (Friedman Two Way Anova: $X^2 = 45.8$, df=2, p<.0000). The same pattern was found for the Ostensive definition group (Friedman Two Way Anova: $X^2 = 9.5$, df=2, p<.05), the Lexical contrast group (Friedman Two Way Anova: $X^2 = 16.4$, df=2, p<.0005) and the Definition group (Friedman Two Way Anova: $X^2 = 23.1$, df=2, p<.0000).

Does the children's prior knowledge of the lexical items influence their performance in the short questions task?

Categorisation questions

Figure 7.13 shows that all the children performed better in the partially represented words than the unknown words across testing. The differences were found to be significant (Wilcoxon: P1: Z=2.5, p<.05; P2: Z=1.9, p<.05; P3: Z=2.8, p<.005). Separate analysis for each group revealed the same pattern. Significant differences were found for the Definition group during post test 1 (Wilcoxon: Z=2.07, p<.05).

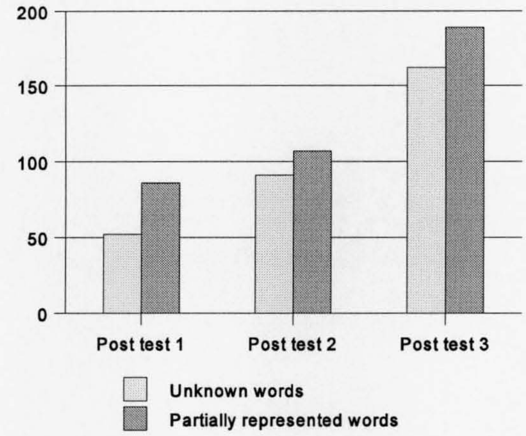
Figure 7.13 Total number of correct responses in the "categorisation questions" by children's prior knowledge of the lexical items across testing



World knowledge questions

Figure 7.14 below shows that children performed better in the partially represented than the unknown words. The differences were significant across testing (Wilcoxon: P1: Z=4.01, p<.0005; P2: Z=2.04, p<.05; P3: Z=3.05, p<.005). The same pattern was found for the Ostensive definition group in post test 3 (Wilcoxon: Z=2.4, p<.05) and the Lexical contrast group in post test 1 (Wilcoxon: Z=3.2, p<.005) and post test 3 (Wilcoxon: Z=2.07, p<.05).

Figure 7.14. Total number of correct responses in the "world knowledge" questions by children's prior knowledge of the lexical items across testing

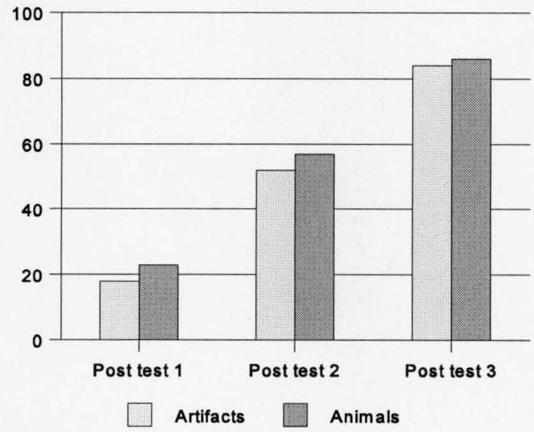


Is performance in the short questions task influenced by the semantic domain of the lexical items?

Categorisation questions

Figure 7.15 shows that children's performance in the categorisation questions did not differ by the semantic domain of the lexical items. Statistical analysis revealed no significant differences.

Figure 7.15 Total number of correct responses in the "categorisation questions" by semantic domain across testing

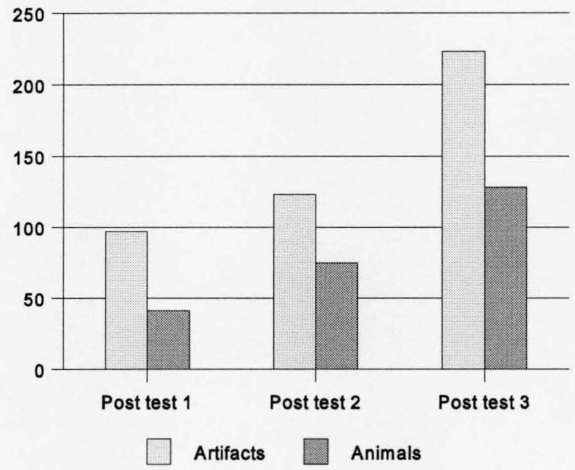


World knowledge questions

Figure 7.16 shows that all the children performed significantly better in the words describing artifacts than in the words describing animals across testing (Wilcoxon: P1: Z=4.9, p<.0000;

P2: Z=4.9, p<.0000; P3: Z= 7.2, p<.0000). Separate analysis for each group demonstrated the same pattern. The differences were significant for the Control (Wilcoxon: Z=4.01, p<.0005), the Phonological control group (Wilcoxon: Z=4.1, p<.0000), the Ostensive definition group (Wilcoxon: P1: Z=2.7, p<.05; P2: Z=3.4, P3: Z=3.4, p<.0005), the Lexical contrast group (Wilcoxon: P1: Z=2.2, p<.05; P2: Z=1.9, p<.05; P3: Z=2.2, p<.05) and the Definition group (Wilcoxon: P1: Z=3.6, p<.0005; P2: Z=2.9, p<.005).

Figure 7.16 Total number of correct responses in the world knowledge questions by semantic domain across testing



To what extent does the child's prior lexical knowledge (Comprehension and Naming) influence performance in the short questions task ?

Categorisation questions

Children with high level baseline comprehension vocabulary performed better than children with low level baseline comprehension vocabulary. Significant differences were found for post test 2 (Mann-Whitney U: Z=2.8, p<.005) and post test 3 (Mann-Whitney U: Z=3.3, p<.005). Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Lexical contrast group during post test 1 (Mann-Whitney U: Z=2.06, p<.05) and post test 3 (Mann-Whitney U: Z=2.3, p<.05).

In addition children with high level baseline naming vocabulary performed better than children with low level baseline naming vocabulary. Significant differences were found for post test 2 (Mann-Whitney U: Z=2.4, p<.05) and post test 3 (Mann-Whitney U: Z=3.1, p<.005). Separate analysis for each group revealed the same pattern. Significant differences were found for the Control group (Mann-Whitney U: Z=2.3, p<.05).

World knowledge questions

Children with high level baseline comprehension vocabulary performed better in the "*world knowledge*" questions than children with low level baseline comprehension vocabulary. However, the differences were not significant. Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Ostensive definition group (Mann-Whitney U: Z=2.1, p<.05) and the Definition group (Mann-Whitney U: Z=2.2, p<.05) during post test 1.

Furthermore, children with high level baseline naming vocabulary performed better than children with low level vocabulary knowledge. Significant differences were found for post test 3 (Mann-Whitney U: Z=2.8, p<.005). Separate analysis for each group revealed the same pattern, however the differences were not significant .

Key findings from the short questions task

Is there a differential impact of the type of exposure to new lexical items that the children receive on their performance in the short questions task ?

Categorisation questions

- Children's performance on the "*categorisation questions*" differed significantly by group during post test 2 and post test 3 but not post test 1.
- During post test 2 the Definition group performed significantly better than the Ostensive definition and Lexical contrast group. During post test 3 the Definition group performed significantly better than all the other groups.

Word knowledge questions

- Children's performance in the world knowledge questions differed significantly by group across testing.
- During post test 2 the Lexical contrast and Definition group performed significantly better than the Ostensive definition group. During post test 3 the Lexical contrast and

Definition group performed significantly better than the Control, the Phonological Control and the Ostensive definition group.

Does children's performance on the short questions task improve with increased exposure to the lexical items?

Categorisation questions

- Children's performance to the "*categorisation questions*" improved significantly over time. The same pattern was evident for the Ostensive definition and the Definition group.

World knowledge questions

- Children's performance on the "*world knowledge*" questions improved significantly over time. The same pattern was found for all the experimental groups.

Does the children's prior knowledge of the lexical items influence performance in the short questions task ?

Categorisation questions

- All the children performed better on the partially represented words than the unknown words across testing. Separate analysis for each group revealed the same pattern. Significant differences were only found for the Definition group during post test 1.

World knowledge questions

- The children performed better on the partially represented than the unknown words across testing. The same pattern was significant for the Ostensive definition group in post test 3, the Lexical contrast group in post test 1 and post test 3.

Is performance on the short questions task influenced by the semantic domain of the lexical items?

Categorisation questions

- Children's performance on the "*categorisation questions*" was not found to differ by the semantic domain.

World knowledge questions

- All the children performed significantly better on the words describing artifacts than in the words describing animals across testing. Separate analysis for each group demonstrated the same pattern. The differences were found to be significant for the Control, the Phonological control group, the Ostensive definition, Lexical contrast and Definition group.

To what extent does the child's prior lexical knowledge (Comprehension and Naming) influence performance on the short questions task ?

Categorisation questions by baseline comprehension vocabulary

- Children with high level baseline comprehension vocabulary performed better than children with low level baseline comprehension vocabulary. Significant differences were found for post test 2 and 3. Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Lexical contrast group during post test 1 and 3.

Categorisation questions by baseline naming vocabulary

- In addition children with high level baseline naming vocabulary performed better than children with low level baseline naming vocabulary. Significant differences were found for post test 2 and 3. Separate analysis for each group revealed the same pattern. Significant differences were found for the Control group.

World knowledge questions by baseline comprehension vocabulary

- Children with high level baseline comprehension vocabulary performed better in the world knowledge questions than children with low level baseline comprehension vocabulary. However, the differences were not significant. Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Ostensive definition and Definition group during post test 1.

World knowledge questions by baseline naming vocabulary

- Children with high level baseline naming vocabulary performed better than children with low level baseline vocabulary knowledge. Significant differences were found for post test 3. Separate analysis for each group revealed the same pattern, however the differences were not significant.

Concluding remarks for the Short questions task

- The analysis of the short questions task (for both types of questions) revealed that the Definition group performed significantly better than the other groups. Also, the Lexical contrast group performed well on the world knowledge questions. All the children improved their performance over time. Furthermore, they performed better on the partially than the unknown words, whereas no differences were found in their performance in the categorisation questions by semantic domain. On the other hand, significant differences in children's performance on the world knowledge questions were found by semantic domain. Additionally, children with high baseline naming and high baseline comprehension vocabulary performed better than children with low baseline naming and low baseline comprehension vocabulary.

The Indirect Measures

7.4.2.2.4 Association task

Scoring criteria for the association task

Children's knowledge was assessed for each of the four lexical items. The present task included two subquestions. (1) Did the children associate the target items with any others? (2) Did they provide an appropriate justification[1] ? Each subquestion was scored separately. Responses were scored as correct and incorrect. Completing the association task was scored as correct, while failure to make the associations was scored as incorrect. Last, provision of appropriate justification was scored as correct, while provision of inappropriate justification was scored as incorrect. In any of the above subquestions, each child could score from 0-4. Qualitative analysis of the justifications was also carried out.

Analysis

Most of the children were able to answer the association questions across testing (to associate the pictures of the target items with others). During post test 1 and 2 the associations reached 97%, while during post test 3 the associations reached 98%. The majority of children who provided associations, also provided justifications for their choices (P1=89.4%; P2=77%; P3:= 86.3%). Figure 7.17 shows that the Definition group provided more justifications than the other groups across testing. The Control group provided fewer justifications than the other groups. In the next sections, the analysis of the association task will be focused on the justifications provided, since from these, inferences can be made about their understanding of the words' meaning.

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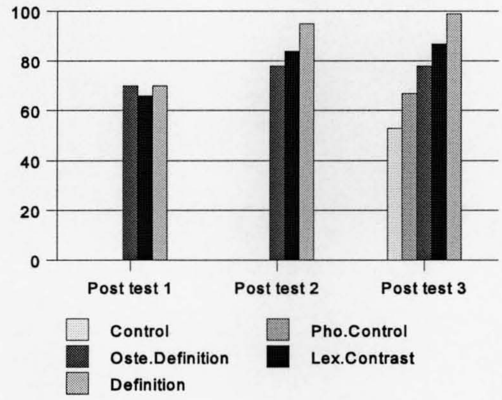
[1]The operational definition of an appropriate justification for the present experiment was if the justification was based on semantic, perceptual or thematic criteria. That decision was based on three major theories of word meaning. Semantic justifications were included according to the Probabilistic view theories that classification at different levels characterizes a word's meaning. Perceptual justifications were included according to theSemantic features hypothesis that a set of features characterizes word meaning. Thematic justifications were included according to the Functional core theory, the relations an object has with other entities is part of a word's meaning.

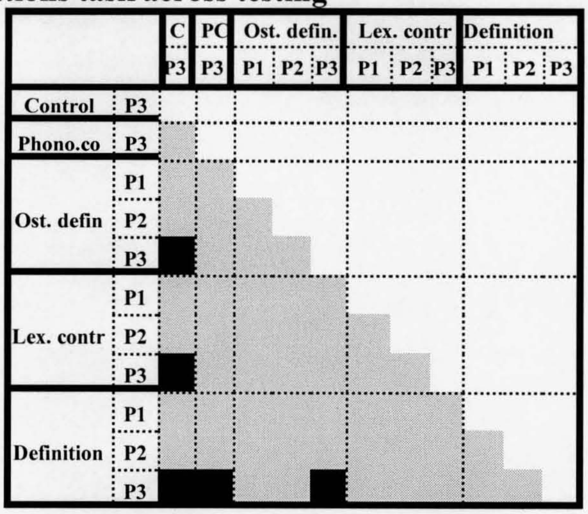
Figure 7.17 Total number of appropriate justifications provided in the association task by group across testing



Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of appropriate justifications?

Children's provision of appropriate justifications (see design section) differed significantly by group during post test 3 (Kruskal-Wallis 1-Way ANOVA: $X^2 = 21.9$, df = 4, p<.0005). No significant differences were found for post tests 1 and 2. Particularly as diagram 7.7 shows, during post test 3 the Ostensive definition group provided significantly more justifications than the Control group (Wilcoxon: Z=2.9, p<.005); the Lexical contrast group provided significantly more justifications than the Control group (Wilcoxon: Z=3.5, p<.0000) and the Definition group provided significantly more justifications than the Control group (Wilcoxon: Z=3.2, p<.0000) .Furthermore, the Definition group provided significantly more justifications than the Phonological control (Wilcoxon: Z=4.3, P<.000) and Ostensive definition group (Wilcoxon, Z=4.1, p<.000).

Diagram 7.7 Significant group differences in the provision of justifications in the associations task across testing



Abbreviations: C=Control PC/Phono.Co= Phonological control; Ost.defin.=Ostensive definition; Lex. contr. Lexical contrast

Does children's provision of justifications in the association task increase with increased exposure to the lexical items ?

The provision of justifications was not found to differ significantly over time. The same pattern was evident for each one of the groups.

Does the children's prior knowledge of the lexical items influence the provision of justifications in the association task?

The provision of justifications did not differ significantly by children's prior knowledge of the lexical items.

Is the provision of justifications in the association task influenced by the semantic domain of the lexical items?

The provision of justifications did not differ significantly by semantic domain.

To what extent does the child's prior lexical knowledge (Comprehension and Naming) influence the provision of justifications in the association task?"

There was a trend for the children with high level baseline comprehension vocabulary to provide more justifications than children with low level baseline comprehension vocabulary across testing. The same analysis was repeated for each group. The same pattern was found, however, significant differences were only found for the Lexical contrast group during post test 1(Mann-Whitney U: $Z=2.5$, $p<.05$).

In addition children with high level baseline naming vocabulary provided more justifications than children with low level baseline naming vocabulary. The differences were significant only in Post test 1. The same analysis was repeated for each group. The same pattern was found for all of them but the differences were not significant.

Qualitative analysis

Types of justifications

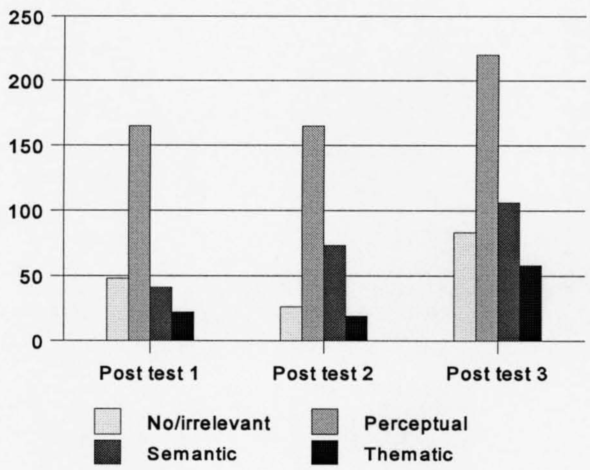
Children provided justifications for their associations which were based on different criteria. The main types of justifications identified are presented in Table 7.14.

Table 7.14 Types of justifications provided in the association task

Justifications	Example
No/irrelevant justification	If no or an irrelevant justification was given
Perceptual justification	E.g.*"because they are brown"*
Semantic justification	E.g. *"because they are animals"*
Thematic justification	E.g.*"because the stool goes next to a table"*

The distribution of children's justifications for their associations over time was investigated. Figure 7.18 presents the distribution of children's responses.

Figure 7.18 Types of justifications provided in the association task across testing



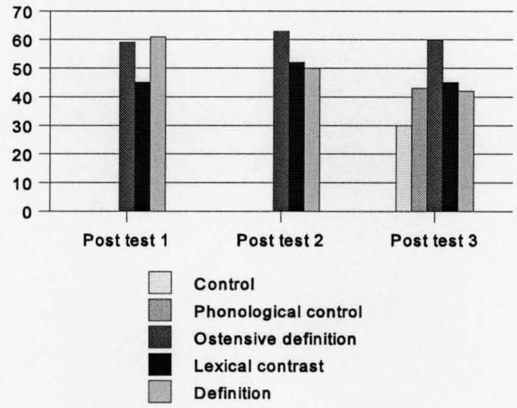
As the above figure shows, children's justifications were mainly "*perceptual*". The second most frequent type of justification was "*semantic*". "*Thematic*" justifications were also provided in a few instances. The statistical analysis revealed that children provided significantly more "*perceptual*" than "*semantic*" (Wilcoxon, P1: Z= 5.4, p<.0000; P2: Z=4.07, p<.0000; P3: Z=3.7, p<.0005) and "*thematic*" justifications (P1: Z=5.8, p<.0000; P2: Z=6.2, p<.0000; P3: Z=5.9, p<.0000). All the children also provided more "*semantic*" than "*thematic*" justifications during post test 2 (Wilcoxon: Z= 4.1, p<.0000) and post test 3 (Wilcoxon: Z=2.4, p<.05).

Analysis of the Perceptual justifications

Is there a differential impact of the type of exposure to new lexical items that the children receive on their provision of perceptual justifications?

By considering children's responses by group there were 104 for each group if they provided "*perceptual*" justifications for all the four target words. The Ostensive definition and Definition groups during post test 1, provided more "*perceptual*" justifications than the other groups. However, in post tests 2 and 3 the Definition group decreased the number of "*perceptual*" justifications while, the Ostensive definition group still provided more "*perceptual*" justifications than the other groups. The Control group did not provide many "*perceptual*" justifications. Figure 7.19 below shows the distribution of "*perceptual*" justifications by group across testing.

Figure 7.19 Provision of perceptual justifications by group across testing



Three One Way Analyses of Variance were carried out. Each time, group was the independent variable and score in the "*perceptual*" justifications was the dependent variable. No significant differences were found.

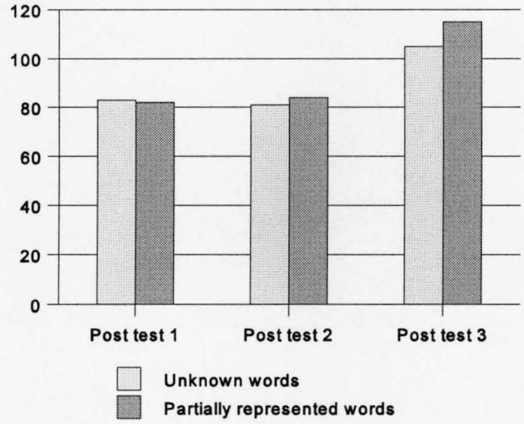
Do children's provision of perceptual justifications increase with increased exposure to the lexical items?

All the children tended to provide more "*perceptual*" justifications across testing, however the differences were not significant. The same analysis was repeated separately for each of the experimental groups. The Definition group provided significantly fewer "*perceptual*" justifications in post test 3 than post test 1 ($t=2.56$, $df=25$, $p<.05$).

Does the children's prior knowledge of the lexical items influence the provision of perceptual justifications?

As the figure 7.20 below shows, the provision of *"perceptual"* justifications did not differ by the children's prior knowledge of the lexical items. Statistical analysis revealed no significant differences.

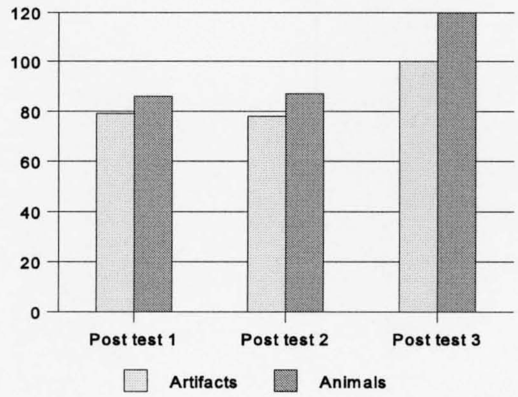
Figure 7.20 Provision of perceptual justifications by children's prior knowledge of lexical items across testing



Is the provision of perceptual justifications influenced by the semantic domain of the lexical items?

Figure 7.21 shows that the children provided more *"perceptual"* justifications for the words describing animals than for the words describing artifacts.

Figure 7.21 Provision of perceptual justifications by semantic domain across testing



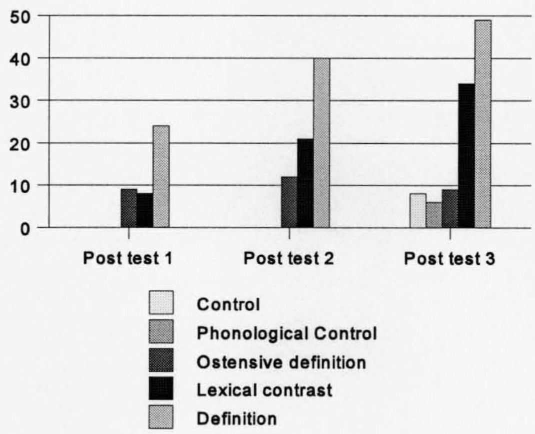
Statistical analysis revealed that the children tended to provide more "*perceptual*" justifications for the words describing animals than for the words describing artifacts. Significant differences were found during post test 3 ($t=2.27$, $df=129$, $p<.05$).The same analysis was repeated separately for each group. The same pattern was found for all the groups, however the differences were not significant.

Analysis of the Semantic justifications

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of semantic justifications?

Figure 7.22 shows that the Lexical contrast and Definition groups provided more "*semantic*" justifications across testing. Nevertheless, the Definition group provided more "semantic" justifications than the other groups across testing. On the other hand, the Control, Phonological control and Ostensive definition groups did not provide as many "*semantic*" justifications.

Figure 7.22 Provision of semantic justifications in the association task by group across testing



Three One Way Analyses of Variance were carried out to test differences by group. Each time, group was the independent variable and score in the "*semantic*" justifications was the dependent variable. The Definition group provided significantly more "*semantic*" justifications than the Lexical contrast group (Wilcoxon: P1: $Z=1.9$, $p<.05$; P2: $Z=2.5$, $p<.05$) as well as more "*semantic*" justifications than the Ostensive definition group during post test 2 (Wilcoxon: $Z=3.7$, $p<.0005$). During post test 3, the Definition and Lexical contrast groups provided significantly more "*semantic*" justifications than the Control group (Wilcoxon:

Z=4.3, p<.0000; Z=3.1, p<.005). Also, the Definition and Lexical contrast groups provided more "*semantic*" justifications than the Phonological control group (Wilcoxon:Z=4.4, p<.0000; Z=2.9, p<.005).The Definition and Lexical contrast groups provided again more "*semantic*" justifications than the Ostensive definition group (Wilcoxon: Z=4.1, p<.0000) and (Wilcoxon: Z=2.5, p<.05).

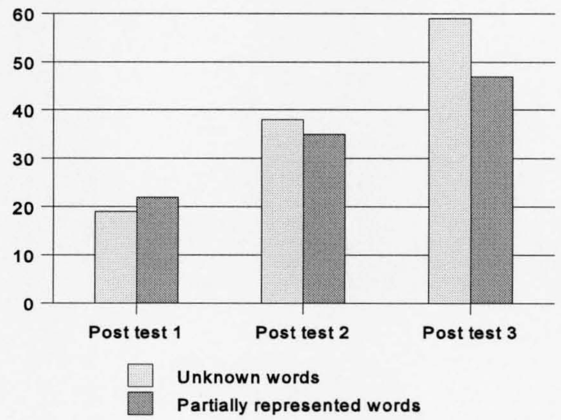
Does children's provision of semantic justifications increase with increased exposure to the lexical items?

A Friedman -Two -Way ANOVA was carried out. The children provided significantly more "*semantic*" justifications over time (X^2=12.3, df=2, p=.005). In addition, the same pattern was evident for the Lexical contrast (X^2=6.5, df=2, p=.05) and Definition group (X^2=12.2, df=2, p=.005).

Does the children's prior knowledge of the lexical items influence the provision of semantic justifications?

As Figure 7.23 shows, during post test 1, the children tended to provide more "*semantic*" justifications for the partially represented than the unknown words, while during post tests 2 and 3 they provided more "*semantic*" justifications for the unknown than the partially represented words. However, the differences were not significant.

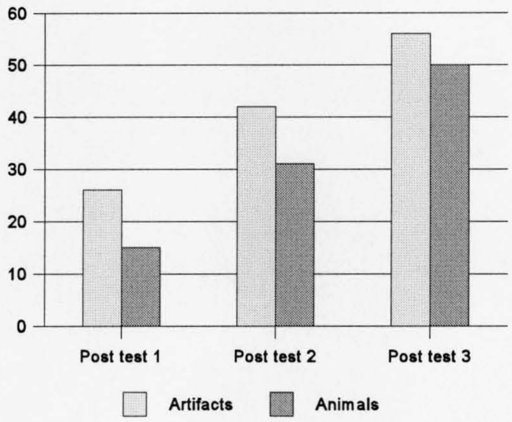
Figure 7.23 Provision of semantic justifications by children's prior knowledge of the lexical items across testing



Is the provision of semantic justifications influenced by the semantic domain of the lexical items?

Figure 7.24 shows that the children provided more "*semantic*" justifications for the words describing artifacts than for the words describing animals. Significant differences were only found for post test 1 (Wilcoxon: Z=1.9, p<.05).

Figure 7.24 Provision of semantic justifications by the semantic domain of the lexical items across testing



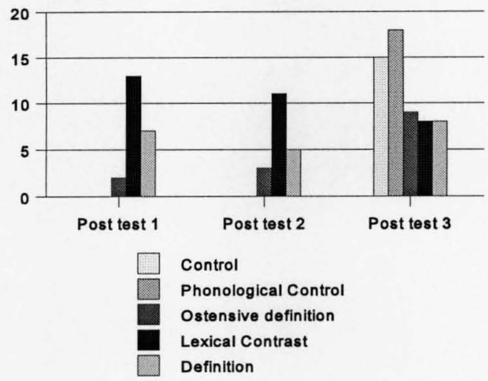
The same analysis was repeated separately for each group. The same pattern was found for the Definition group during post test 1 (Wilcoxon: Z=2.6, p<.05) and post test 2 (Wilcoxon: Z=2.04, p<.05). No significant differences were found for post test 3.

Analysis of the Thematic justifications

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of thematic justifications?

Figure 7.25 below shows that during post tests 1 and 2 the Lexical contrast group provided more "*thematic*" justifications than the other groups. In addition, during post test 3 the Phonological control and Control groups provided more "*thematic*" justifications than the other groups.

Figure 7.25 Provision of thematic justifications by group across testing



The statistical analysis revealed that during post test 3, the Phonological Control group provided significantly more "*thematic*" justifications than the Lexical contrast (Wilcoxon: Z=2.03, p<.05) and Definition groups (Wilcoxon:Z=2.03, p<.05).

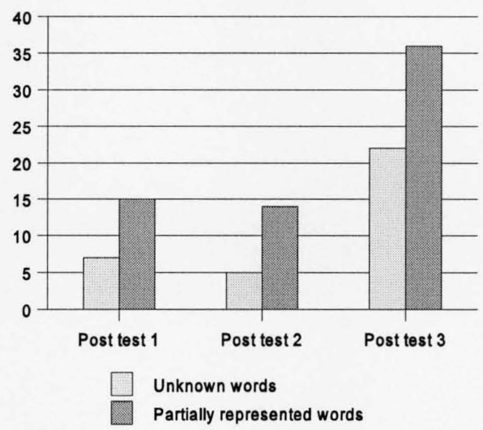
Does children's provision of thematic justifications increase with increased exposure to the lexical items?

No significant differences were found.

Does the children's prior knowledge of the lexical items influence the provision of thematic justifications?

As the figure 7.26 shows the children provided more "*thematic*" justifications for the partially represented than the unknown words across testing .

Figure 7.26 Provision of thematic justifications by children's prior knowledge of the lexical items across testing

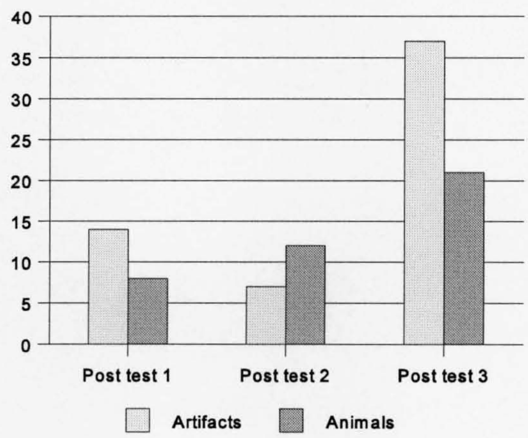


The differences were found to be significant for post test 2 (Wilcoxon: Z=2.1, p<.05) and post test 3 (Wilcoxon: Z=2.4, p<.05). The same pattern was also found for each one of the groups. The differences were significant for the Ostensive definition group during post test 3 (Wilcoxon: Z= 2.2, p<.05).

Is the provision of thematic justifications influenced by the semantic domain of the lexical items ?

Figure 7.27 below shows that during post tests 1 and 3 the children provided more "*thematic*" justifications for words describing artifacts than for those describing animals. The differences were found to be significant for post test 3 (Wilcoxon: Z=2.2, p<.05). The same pattern was found for each group, however the differences were not significant.

Figure 7.27 Provision of thematic justifications by semantic domain across testing



Key findings from the Association task

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of appropriate justifications?

- Children's provision of justifications differed significantly by group during post test 3. Particularly, all the experimental groups provided significantly more justifications than the Control group. In addition, the Definition group provided more justifications than the Phonological control and the Ostensive definition groups.

Does children's provision of justifications in the association task increase with increased exposure to the lexical items ?

- No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence the provision of justifications in the association task?

- No significant differences were found by the children's prior knowledge of the lexical items.

Is the provision of justifications in the association task influenced by the semantic domain of the lexical items?

- No significant differences were found by semantic domain.

To what extent does the child's prior lexical knowledge (Comprehension and Naming) influence the provision of justifications in the association task?"

Baseline Comprehension Vocabulary

- There was a trend for the children with high level baseline comprehension vocabulary to provide more justifications than children with low level baseline comprehension vocabulary. Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Lexical contrast group during post test 1.

Baseline Naming Vocabulary

- There was a trend for the children with high level baseline naming vocabulary to provide more justifications than children with low level baseline naming vocabulary. Significant differences were found for post test 1. The same analysis was repeated for each group. The same pattern was found for all of them.

Types of justifications

- Children provided "*perceptual*", "*semantic*", and "*thematic*" justifications for their associations. Across testing, they provided significantly more "*perceptual*" than "*semantic*" and "*thematic*" justifications. In addition, during post test 2, they provided significantly more "*semantic*" than "*thematic*" justifications.

Perceptual justifications

Is there a differential impact of they type of exposure to new lexical items that the children receive on their provision of perceptual justifications?

- The provision of "*perceptual*" justifications did not differ significantly by group.

Do children's provision of perceptual justifications increase with increased exposure to the lexical items?

- The Definition group during post test 3 provided significantly fewer "*perceptual*" justifications than in post test 1.

Does the children's prior knowledge of the lexical items influence the provision of perceptual justifications?

- No significant differences were found.

Is the provision of perceptual justifications influenced by the semantic domain of the lexical items?

- Children provided more "*perceptual*" justifications for the words describing animals than the words describing artifacts. The differences were found to be significant for post test 3. The same pattern was found for each group, however the differences were not significant.

Semantic justifications

Is there a differential impact of they type of exposure to new lexical items that the children receive on their provision of semantic justifications?

- During post test 1 and 2 the Definition group provided significantly more "*semantic*" justifications than the Ostensive definition and Lexical contrast group.

Do children's provision of perceptual justifications increase with increased exposure to the lexical items?

- No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence the provision of semantic justifications ?

- No significant differences were found.

Is the provision of semantic justifications influenced by the semantic domain of the lexical items?

- The children provided more "*semantic*" justifications for the words describing artifacts than the words describing animals. The differences were found significant for post test 1. Significant differences were also found for the Definition group, during post tests 1 and 2.

Thematic Justifications

Is there a differential impact of the type of exposure to new lexical items that the children receive on their provision of thematic justifications?

- During post test 3 the Phonological control group provided significantly more "*thematic*" justifications than the Lexical contrast and Definition groups.

Do children's provision of thematic justifications increase with increased exposure to the lexical items?

- No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence the provision of thematic justifications?

- The children during post tests 2 and 3 provided significantly more "*thematic*" justifications for the partially represented words than the unknown words. The same pattern was found for each group, however, significant differences were only found for the Ostensive definition group during post test 3.

Is the provision of thematic justifications influenced by the semantic domain of the lexical items?

- The children provided more "*thematic*" justifications for the words describing artifacts than the words describing animals. The differences were found to be significant for post test 3. Significant differences were also found for the each group across testing.

Concluding remarks for the association task

- The analysis of the association task revealed that children in the Definition group provided more justifications than children in the other groups. Overall, no significant differences in the provision of justifications were found over time. Furthermore, the provision of justifications did not differ by the children's prior knowledge of the lexical items and by the semantic domain. On the other hand, there was a trend for the children with high level baseline Comprehension and Naming vocabulary to provide more appropriate justifications than children with low level baseline Comprehension and Naming vocabulary.

- Children provided "*perceptual*", "*semantic*" and "*thematic*" justifications for their associations. Provision of "*perceptual*" justifications did not differ by group, whereas children from the Definition group provided more "*semantic*" justifications than children from the other experimental groups. Additionally, the Phonological group provided more "*thematic*" justifications than children from the Lexical contrast and the Definition groups. Children provided, in general, fewer "*perceptual*" justifications over time. Children's provision of "*perceptual*" and "*semantic*" justifications did not differ by their knowledge of the lexical items, while children provided more "*thematic*" justifications for the partially represented than the unknown words. Lastly, children provided more "*perceptual*" justifications for the words describing animals than artifacts, whereas they provided more "*semantic*" and "*thematic*" justifications for the words describing artifacts than the words describing animals.

7.4.2.2.5 Contrast task

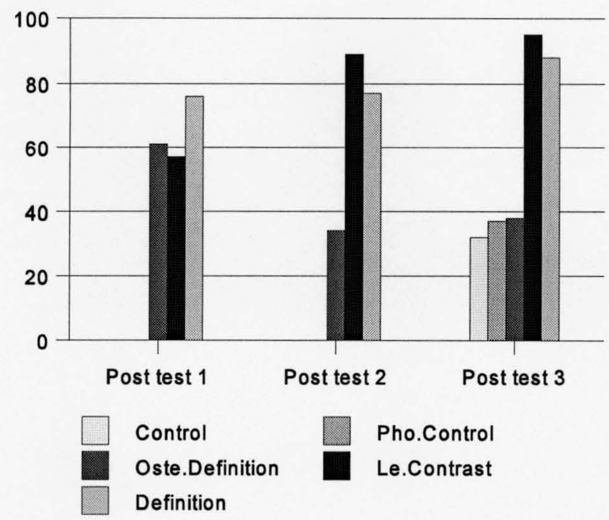
Scoring criteria for the contrast task

Children's knowledge was assessed for each of the four lexical items. The present task included the question Did they provide appropriate contrasts ? For the present experiment the contrasts were appropriate when they contrasted the target word with another from the same semantic category. For example, appropriate contrast for the ostrich and mole was any animal contrast, while appropriate contrast for the ladle was any cutlery contrast and for the stool any furniture contrast. Responses were scored as correct and incorrect. Provision of appropriate contrasts was scored as correct, while failure to provide appropriate contrasts was scored as incorrect. Each child could score from 0 - 4. Qualitative analysis of children's contrasts was also carried out.

Analysis

More than half of the children provided appropriate contrasts for the target words across testing. By considering children from each group, there were 104 responses if they provided contrasts for all the four target words. Figure 7.28 shows that the Lexical contrast group provided more contrasts than the other groups during post test 2 and 3, while no significant differences were found during post test 1.

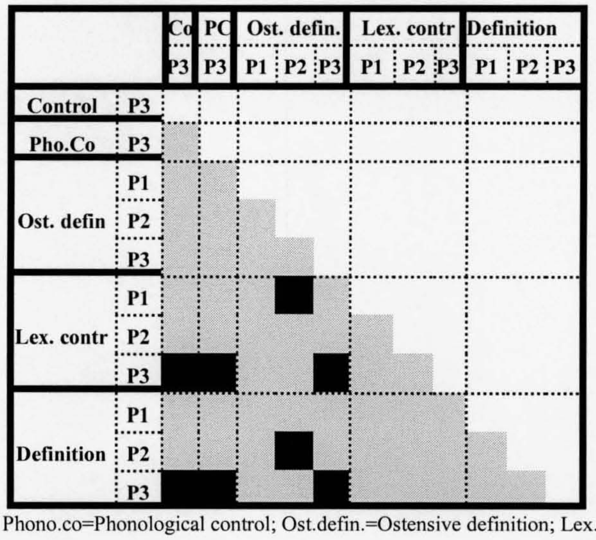
Figure 7.28 Total number of correct responses in the contrast task by group across testing



Is there a differential effect of the type of exposure to new lexical items that the children receive on the provision of contrasts?

No significant differences were found during post test 1. Significant differences were found during post test 2 (Kruskall-Wallis 1-Way Anova: X^2=11.8, df=2, p<.005) and post test 3. Particularly, during post test 2 the Lexical contrast and Definition groups provided significantly more contrasts than the Ostensive definition group (Wilcoxon: Z=3.2, p<.005 and Z=2.8, p<.005 respectively). During post test 3 the Lexical contrast group provided significantly more contrasts than the Control, Phonological control and Ostensive definition groups (Z=3.06, p<.005; Z=3.2, p<.005; Z=3.4, p<.005).The Definition group also performed provided significantly more contrasts than the Control, the Phonological control and Ostensive definition groups (Wilcoxon: Z=3.03, p<.005; Z=3.1, p<.005; Z=3.4, p<.005). Diagram 7.8 presents all the significant differences between the groups.

Diagram 7.8 Significant group differences in the provision of contrasts in the contrast task across testing



Abbreviations: Co= Control; PC/ Phono.co=Phonological control; Ost.defin.=Ostensive definition; Lex. contr. Lexical contrast

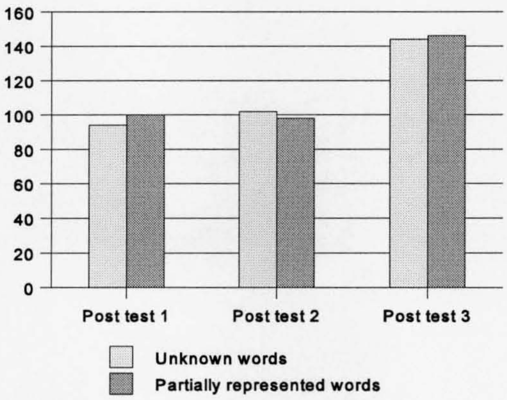
Does children's performance on the Contrast task improve with increased exposure to the lexical items ?

No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence performance on the contrast task ?

Figure 7.29 shows that the children provided the same number of contrasts for both the partially represented and the unknown words. Statistical analysis revealed no significant differences.

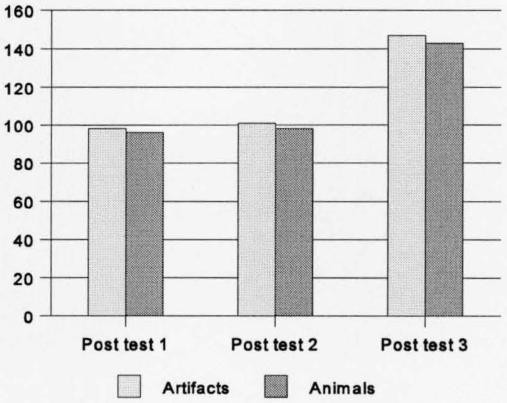
Figure 7.29 Total provision of contrasts by children's prior knowledge of the lexical items across testing



Is the provision of contrasts influenced by the semantic domain of the lexical items?

Figure 7.30 shows that the provision of appropriate contrasts did not differ by the semantic domain. No significant differences were found.

Figure 7.30 Total number of contrasts by semantic domain across testing



To what extent does the child's prior lexical knowledge (Comprehension and Naming) influence the provision of animal contrasts in the Contrast task?"

The provision of contrasts did not differ significantly by the level of baseline comprehension vocabulary. The same pattern was found for each group. On the other hand, children with high baseline naming vocabulary provided more contrasts than children with low baseline naming vocabulary across testing. Significant differences were found for post test 2 (Mann-Whitney U: $Z=2.7$, $p<.05$) and post test 3 (Mann-Whitney U: $Z=2.2$, $p<.0005$). The analysis was repeated separately for each group. The same pattern was found for all the groups. Significant differences were found for the Lexical contrast group in post test 2 (Mann-Whitney U: $Z=2.2$, $p<.05$).

Qualitative analysis

Children provided different types of contrasts which are presented in Table 7.15 below.

Table 7.15 Types of contrasts provided in the contrast task

Justifications	Example
Don't know	No responses were provided
Animals contrast	E.g. *"The ostrich is different from an elephant"*
Cutlery contrast	E.g. *"The ladle is different from a spoon"*
Furniture contrast	E.g. "*The stool is different from a chair*"
Other contrasts	Contrast with items from other semantic categories

Examination of the distribution of children's contrasts for each target word over time was carried out. The table in Appendix 7.7 presents the results. From the responses given, it is evident that the children provided appropriate contrasts for each target word. These contrasts were mainly semantic. For example, for the ostrich and the mole they provided contrasts with animals, e.g "*the ostrich is different from a duck*" or "*the mole is different from the badger*" while for the ladle contrasts were made with cutlery, "*the ladle is different from a spoon*" and for the stool contrasts were made with other furniture, e.g "*the stool is different from a chair*".

Statistical analysis revealed that the children provided significantly more animal contrasts for the ostrich and the mole than for the other words across testing (P1: $X^2=26.4$, df=3, $p<.0000$; P2: $X^2=16.3$ df=3, $p<.005$; P3: $X^2=34.3$ df=3, $p<.0000$). They also provided significantly more cutlery contrasts for the ladle than for the other words (P1: $X^2=12.5$, df=3, p<.005; P2: X^2 =14.1 df=3, p<.005; P3: X^2=13.3 df=3, p<.005). Last, they provided significantly more furniture contrasts for the stool than for the other words (P1: X^2=18.2, df=3, p<.0005; P2: X^2=15.8 df=3, p<.005; P3: X^2=16.4, df=3, p<.005).

Analysis of the "animal contrasts"[1]

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of "animal contrasts"?

Three One Way Analyses of Variances were carried out with group as the independent variable and score for animal contrasts in each post test as the dependent variable. No significant differences were found during post test 1. Significant differences were found during post test 2 [F(2,75) =8.5, p<.0000] and post test 3 [F(4,125) =8.3, p<.0000]. The means are given in the Table 7.16 below.

Table 7.16 Children's provision (means and sds) of "animal contrasts" in the contrast task by group across testing

	Post test 1		Post test 2		Post test 3	
	Mean	**Sd**	**Mean**	**Sd**	**Mean**	**Sd**
Control					.61	(.94)
Pho.Control					.61	(.89)
Osten. Definition	.88	(.86)	.34	(56)	.50	(.81)
Lexi.Contrast	.92	(.93)	1.15	(.88)	1.38	(.80)
Definition	1.07	(.84)	1.07	(.84)	1.50	(.76)

Particularly, the post hoc analysis for post test 2 demonstrated that the Definition and the Lexical contrast group provided significantly more animal contrasts for the ostrich and mole than the Ostensive definition group. In addition, during post test 3, the Lexical contrast and Definition group provided significantly more animal contrasts than the Control, Phonological control and Ostensive definition groups.

Does children's provision of "animal contrasts" increase with increased exposure to the lexical items ?

Statistical analysis revealed no significant differences over time.

[1] The score for animal contrasts was computed by adding the animal contrasts provided for the two animal words.

Does the children's prior knowledge of the lexical items influence the provision of "animal contrasts"?

Statistical analysis revealed no significant differences.

Is the provision of "animal contrasts" influenced by the semantic domain of the lexical items?

The children provided significantly more animal contrasts for the words describing animals than for the words describing artifacts across testing (Wilcoxon, P1: Z=5.3, p<.0005; P2: Z=4.2, p<.0005; P3: Z=6.3, p<.0005). The same pattern was evident for each one of the groups across testing. The differences were found to be significant for the Control group (Wilcoxon: P3: Z=2.5, p<.05), the Phonological control group (Wilcoxon: P3: Z=2.1, p<.0) the Ostensive definition group (Wilcoxon: P1: Z=2.7, p<.05) the Lexical contrast group (Wilcoxon: P1: Z=2.8, p<.005; P2: Z=2.8, p<.005; P3: 3.3, p<.005); and Definition group (Wilcoxon: P1: 3.7, p<.0005; P2: Z=2.8, p<.005; P3: Z=3.9, p<.0005).

Analysis of the "cutlery contrasts"

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of "cutlery contrasts"?

During post test 2 the Definition group provided significantly more cutlery contrasts than the Ostensive definition group (Wilcoxon: Z=2.04, p<.05). Last, during post test 3, the Lexical contrast group provided significantly more cutlery contrasts than the Control (Wilcoxon: Z=2.1, p<.05) and the Phonological control group (Wilcoxon: Z=2.1, p<.05).

Does children's provision of "cutlery contrasts" increase with increased exposure to the lexical items?

Statistical analysis revealed no significant differences over time.

Does the children's prior knowledge of the lexical items influence the provision of "cutlery contrasts"?

The children provided significantly more cutlery contrasts for the unknown than for the partially represented words across testing (Wilcoxon: P1: Z=3.7, p<.0005; P2: Z=3.4, p<.0005; P3: Z=4.2, p<.0000). The same pattern was evident for the Ostensive definition group across testing (Wilcoxon: P1: Z=2.2, p<.05; P2: Z=2.02, p<.05; P3: Z=2.3, p<.05), the

Lexical contrast group during post tests 2 and 3 (Wilcoxon: P2: Z=2.6, p<.05; P3: Z=2.3, p<.05) and the Definition group during post test 1 (Wilcoxon: P1: Z=2.6, p<.05).

Is the provision of "cutlery contrasts" influenced by the semantic domain of the lexical items?

Children provided significantly more cutlery contrasts for the words describing artifacts than for the words describing animals across testing (Wilcoxon, P1:Z=3.9, p<.0005; P2: Z=4.2, p<.0000; P3: Z=4.1, p<.0000). The same pattern was found for each group. Significant differences were found for the Phonological control group (Wilcoxon, P3: Z=2.02, p<.05), the Ostensive definition group across testing (Wilcoxon, P1: Z=2.2, p<.05; P2: Z=2.02, p<.05; P3: Z=2.2, p<.05), the Lexical contrast group (Wilcoxon, P2: Z=2.6, p<.05) and the Definition group across testing (Wilcoxon, P1: Z=3.07, p<.005; P2: Z=2.7, p<005; P3: Z=2.3, p<.05).

Analysis of the "furniture contrasts"

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of "furniture contrasts"?

Children's performance was not found to differ by the type of exposure during post test 1. During post test 2 the Lexical contrast provided significantly more furniture contrasts (for the stool) than the Ostensive definition group (Wilcoxon: Z=2.2, p<.05). In post test 3 the Lexical contrast group provided significantly more furniture contrasts than the Control (Wilcoxon: Z=1.9, p<.05), the Phonological control (Wilcoxon: Z=2.3, p<.05) and the Ostensive definition group (Wilcoxon: Z=2.9, p<.005). In addition the Definition group provided significantly more contrasts than the Ostensive definition group.

Does children's provision of "furniture contrasts" increase with increased exposure to the lexical items ?

Statistical analysis revealed no significant differences over time.

Does the children's prior knowledge of the lexical items influence the provision of "furniture contrasts"?

The children provided significantly more furniture contrasts for the partially represented than the unknown words across testing (Wilcoxon, P1: Z=3.6, p<.0005; P2: Z=4.1, p<.0000; P3:

Z= 3.8, p<.0000). The same pattern was evident for each one of the groups. Significant differences were found for the Ostensive definition group during post test 2 (Wilcoxon: Z=2.03, p<.05), the Lexical contrast group (Wilcoxon, P2: Z=2.7, p<.05; P3: Z=2.6, p<.05) and the Definition group (Wilcoxon, P1: Z=3.5, p<.0005; P2: Z= 2.4, p<.05).

Is the provision of "furniture contrasts" influenced by the semantic domain of the lexical items?

The children provided significantly more furniture contrasts for the words describing artifacts than for the words describing animals (Wilcoxon, P1: Z=4.3, p<0000; P2: Z=2.7, p<.005; P3: Z=4.8, p<.0000). The same pattern was found for each one of the groups. Significant differences were found for the Control group (Wilcoxon, P3: Z=2.3, p<.05) the Ostensive definition group (Wilcoxon, P1: Z=1.9, p<.05), the Lexical contrast group (Wilcoxon, P1: Z=2.6, p<.05; P3: Z=2.6, p<.05) and the Definition group (Wilcoxon, P1: Z=3.07, p<.005; P3: Z= 2.6, p<.05).

Key findings from the contrast task

Is there a differential effect of the type of exposure to new lexical items that the children receive on the provision of contrasts?

- Children's provision of contrasts differed significantly by group during post tests 2 and 3. During post tests 2 and 3, the Lexical contrast and Definition group provided significantly more contrasts than the Ostensive definition group. During post test 3 also, the Lexical contrast and Definition group provided significantly more contrasts than the Control, the Phonological control and the Ostensive definition groups.

Does children's performance on the Contrast task improve with increased exposure to the lexical items ?

- No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence performance on the contrast task ?

- No significant differences were found by the children's prior knowledge of the lexical items

Is the provision of contrasts influenced by the semantic domain of the lexical items?

- No significant differences were found in the provision of contrasts by the semantic domain of the lexical items.

To what extent does the child's prior lexical knowledge (Comprehension and Naming) influence the provision of animal contrasts in the contrast task?

Baseline Comprehension Vocabulary

- The provision of contrasts did not differ significantly by their baseline comprehension vocabulary.

Baseline Naming Vocabulary

- Children with high naming vocabulary provided more contrasts than children with low baseline naming vocabulary across testing. Significant differences were found for post tests 2 and 3. Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Lexical contrast group in post test 2.

Types of contrasts

- Children provided animal, cutlery, furniture and other contrasts. They provided significantly more animal contrasts for the ostrich and the mole than the other words, more cutlery contrasts for the ladle than the others and more furniture contrasts for the stool than the rest of the target words across testing.

Animal contrasts

Is there a differential impact of the type of exposure to new lexical items that the children receive to the provision of animal contrasts?

- The provision of animal contrasts did not differ significantly by group (Diagram 7.9).

Does children's provision of animal contrasts increase with increased exposure to the lexical items ?

- No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence the provision of animal contrasts?

- No significant differences were found.

Is the provision of animal contrasts influenced by the semantic domain of the lexical items?

- Children provided significantly more animal contrasts for the words describing animals than the words describing artifacts. The same pattern was found for each group.

Cutlery contrasts

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of cutlery contrasts?

- The Definition group provided significantly more cutlery contrasts than the Ostensive definition group during post test 2. In post test 3 the Lexical contrast group provided more cutlery contrasts than the Control and the Phonological control groups (Diagram 7.9).

Does children's provision of cutlery contrasts increase with increased exposure to the lexical items ?

- No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence the provision of cutlery contrasts?

- The children provided significantly more cutlery relations for the unknown than the partially represented words. The same was found for each group.

Is the provision of cutlery contrasts influenced by the semantic domain of the lexical items?

- The children provided significantly more cutlery contrasts for the words describing artifacts than the words describing animals. The same pattern was evident for each group.

Furniture contrasts

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of furniture contrasts?

- No significant differences were found during post test 1. During post test 2, the Lexical contrast group provided significantly more furniture contrasts than the Control the Phonological control and the Ostensive definition groups. The Definition group provided also more furniture contrasts than the Ostensive definition group (Diagram 7.9).

Does children's provision of furniture contrasts increase with increased exposure to the lexical items ?

- No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence the provision of furniture contrasts?

- The children provided significantly more furniture contrasts for the partially represented words than the unknown words. The same pattern was found for each group.

Is the provision of furniture contrasts influenced by the semantic domain of the lexical items?

- The children provided more furniture contrasts for the words describing artifacts than the words describing animals.

Diagram 7.9 Significant group differences in the types of contrasts mentioned across testing

		C	PC	Ost. defin.			Lex. contr			Definition		
		P3	P3	P1	P2	P3	P1	P2	P3	P1	P2	P3
Control	P3											
Pho.Contro	P3											
Ost. defin	P1											
	P2											
	P3											
Lex. contr	P1				An							
	P2											
	P3	Cu Fu	Cu Fu			Fu						
Definition	P1				An							
	P2				Cu Fu							
	P3	An	An			An Fu						

Abbreviations: C= Control; PC/ Phono.co=Phonological control; Ost.defin.=Ostensive definition; Lex. contr. Lexical contrast; An=Animal contrast; Cu=Cutlery contrast; Furniture=Furniture contrast

Concluding remarks for the Contrast task

- The analysis of the contrast task revealed that the Lexical contrast and Definition groups provided more contrasts than the other groups during post test 2 and post test 3. However, no significant differences in the provision of contrasts were found over time. Furthermore, no significant differences were found by children's prior knowledge of lexical items and semantic domain. Additionally, children with high baseline naming vocabulary performed better than children with low baseline naming vocabulary. Children's performance did not differ by their comprehension vocabulary.

- The children provided a variety of contrasts (animal, cutlery, furniture and other contrasts). Provision of animal contrasts did not differ by group. On the other hand, during post test 2 the Definition group provided more cutlery contrasts than the Ostensive definition group. During post test 3, the Lexical contrast group provided more cutlery contrasts than the Control and Phonological control groups. Additionally, during post test 2 the Lexical contrast group provided more furniture contrasts than the Control, the Phonological control and the Ostensive definition groups. No significant differences were found for the provision of any type of contrast over time.

- Furthermore, no significant differences were found for the provision of animal contrasts by children's prior knowledge of the lexical items. On the other hand, children provided more cutlery contrasts for the unknown than the partially represented words (because ladle was an unknown word) and more furniture contrasts for the partially represented than the unknown words (because stool was a partially represented word). Lastly, children provided more animal contrast for the words describing animals than artifacts. On the other hand, they provided more cutlery and furniture contrasts for the words describing artifacts than animals.

7.4.2.2.6 Story generation Task

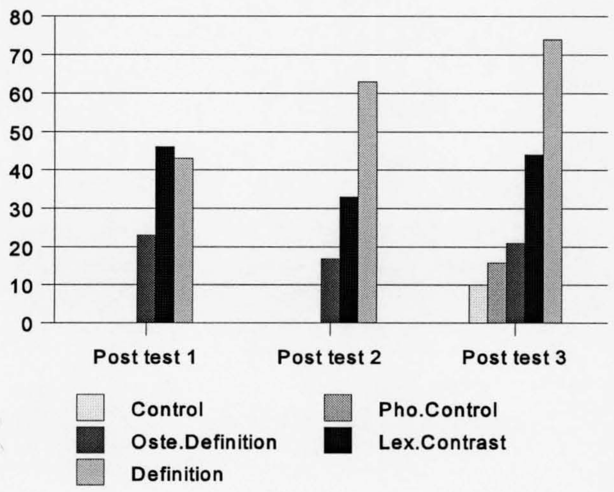
Scoring criteria for the story generation task

Responses were scored as correct and incorrect. Provision of an appropriate story was scored as correct, while failure to provide an appropriate story scored as incorrect. For the purposes of the present experiment, appropriate stories were operationally defined as the stories which included elements which gave information about the word's meaning. Stories which included descriptive, semantic, functional and contextual properties about the target words were appropriate. Each child could get a score from 0 - 4. Qualitative analysis of the stories was also carried out.

Analysis

The children found the task difficult, since the provision of appropriate stories was overall quite low (P1=18.9%, P2=24%, P3=24%). The inter-rater reliability for coding the stories as appropriate reached the 97% of agreement. The following figure shows that the Definition group provided more stories than the other groups across testing.

Figure 7. 31 Total number of correct responses on the story generation task by group across testing

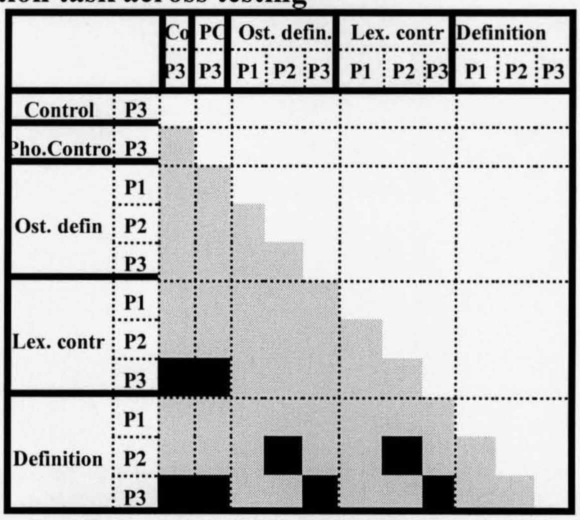


Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of stories?

No significant differences were found for post test 1, while significant differences were found for post test 2 (Kruskall-Wallis-1 Way Anova:X^2 = 16.1, df = 2, p<.005) and post test 3

(Kruskall-Wallis-1 Way Anova:X^2 =26.7, df = 4, p<.0000). Particularly, the Definition group provided significantly more stories than the Ostensive definition (Wilcoxon,: Z=2.8, p<.005) and the Lexical contrast group (Wilcoxon: Z=3.6, p<.0005) during post test 2. During post test 3, the Lexical contrast group provided significantly more stories than the Control (Wilcoxon: Z = 2.1, p<.05) and Phonological Control groups (Wilcoxon: Z = 2.04, p<.05). In addition, the Definition group performed significantly better than the two Control and Experimental groups (Z=3.8, p<.0005; Z=3.8, p<.0005; Z=3.5, p<.0005; Z=2.2, p<.05). No significant differences were found between the two Control groups and the Ostensive definition group in any of the post tests. Diagram 7.10 presents the significant differences between the groups

Diagram 7.10 Significant group differences in the provision of stories in the story generation task across testing

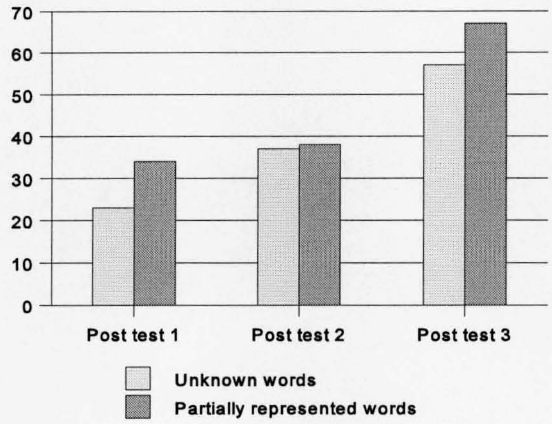


Abbreviations: Co= Control; PC/Phono.co=Phonological control; Ost.defin.=Ostensive definition; Lex. contr. Lexical contrast

Does children's provision of stories increase with increased exposure to the lexical items? All the children provided more stories over time. Particularly, they provided significantly more stories during post test 3 than during post test 1 (Wilcoxon: Z=3.3, p<.005). The analysis was repeated separately for each group. The same pattern was found for the Lexical contrast group (Wilcoxon: Z=2.1, p<.05) and the Definition groups (Wilcoxon: Z=3.2, p<.005). In addition, the Definition group provided significantly more stories during post test 2 than post test 1 (Wilcoxon: Z=2.3, p<.05).

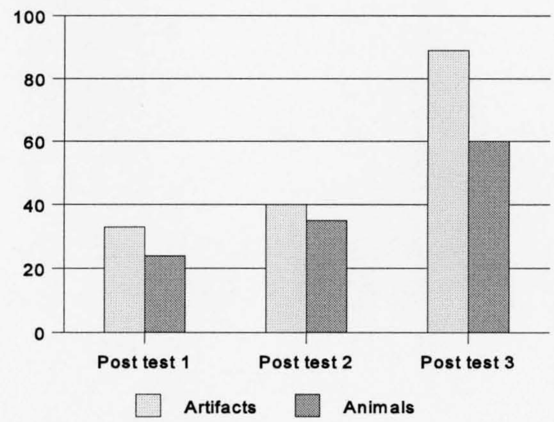
Does the children's prior knowledge of the lexical items influence the provision of stories?
As the Figure 7.32 below shows, children provided more stories for the partially represented than the unknown words across testing. Nevertheless, statistical analysis revealed that the differences were not significant.

Figure 7.32 Total number of stories provided by children's prior knowledge of the lexical items across testing



Is the provision of stories influenced by the semantic domain of the lexical items?
As the Figure 7.33 shows, children provided more stories for the words describing artifacts than for the words describing animals across testing. The differences were significant for post test 3 (Wilcoxon: $Z=2.9$, $p<.005$). The same pattern was found for each one of the groups. The differences were found to be significant for the Lexical contrast (Wilcoxon: $Z=2.03$, $p<.05$) and Definition group (Wilcoxon: $Z=2.0$, $p<.05$) during post test 3.

Figure 7.33 Total number of stories provided by the semantic domain of the lexical items across testing



To what extent does the child's prior knowledge (Comprehension and Naming) influence the provision of stories ?"

The children with high level baseline comprehension vocabulary provided more stories than children with low level baseline comprehension vocabulary across testing. Significant differences were found for post test 3 (Mann-Whitney U: Z=2.4, p<.05). Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Definition group during post test 1 (Mann-Whitney U: Z=2.09, p<.05).

In addition children with high level of baseline naming vocabulary provided more stories than children with low level baseline naming vocabulary across testing. Significant differences were found for post test 2 (Mann-Whitney U: Z=2.5, p<.05) and post test 3 (Mann-Whitney U: Z=2.3, p<.05). Separate analysis for each group revealed the same pattern. However, the differences were not significant.

Qualitative analysis

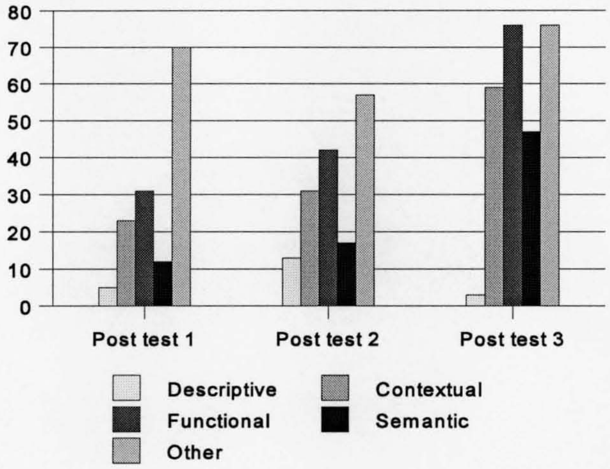
Children's stories included a variety of properties mentioned about the target words' meaning. In addition, during their story-tellings they referred to the target items in different ways. First, the different types of properties mentioned are analysed and then the different ways of reference to the target word follows. The different properties mentioned in children's stories are presented in the following table:

Table 7.17 Types of properties mentioned in children's stories

Type	Example
No/ irrelevant stories	If no or irrelevant stories were provided
Contextual properties	E.g. where the target item can be found
Functional properties	If they mentioned the function of the item
Semantic properties	If they related the target word with others from the same semantic domain
Descriptive properties	If they described the target item

The distribution of the properties mentioned in children's stories is presented on figure 7.34 below.

Figure 7.34 Distribution (raw data) of the properties mentioned on the story task across testing



Considering all the properties except the "other" category, it was found that the children provided significantly more "*contextual*" than "*descriptive*" properties across testing (Wilcoxon, P1: Z=2.5, p<.05; P2: Z=2.7, p<.05; P3: Z=4.9, P<.0000), more "*functional*" than "*descriptive*" properties across testing (Wilcoxon: P1: Z= 3.8, p<.0005; P2: Z=3.0, p<.005; P3: Z= 5.3, p<.0000) and more "*functional*" than "*semantic*" properties (Wilcoxon: P1: Z=2.6, p<.05; P2: Z=3.09, p<.05). During post test 3 they also provided more "*semantic*" than "*descriptive*" properties (Wilcoxon: Z=4.7, p<.0000).

Analysis of the "descriptive properties"

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of descriptive properties?

No significant differences were found for post tests 1 and 3. Significant differences were found for post test 2 (Kruskall-Wallis 1 Way-Anova: $X^2 = 9.8$, df= 2 p<.05). Particularly, the Definition group provided significantly more "*descriptive*" properties than the Ostensive definition (Wilcoxon: Z = 2.06, p<.05) and Lexical contrast groups (Wilcoxon: Z = 2.5, p<.05).

Does children's provision of descriptive properties increase with increased exposure to the lexical items?

Statistical analysis revealed no significant differences over time.

Does the children's prior knowledge of the lexical items influence the provision of descriptive properties ?

The provision of "*descriptive*" properties did not differ by the children's prior knowledge.

Is the provision of descriptive properties influenced by the semantic domain of the lexical items?

The provision of "*descriptive*" properties did not differ by the semantic domain of the lexical items.

Analysis of the "contextual properties"

Is there a differential impact of the type of exposure to new lexical items that the children receive to the provision of contextual properties?

No significant differences were found for post test 1 and post test 2. Significant differences were found for post test 3 (Kruskall-Wallis 1-Way Anova: X^2 =12.4, df=4, $p<.05$). Particularly, the Definition group provided significantly more "*contextual*" properties than the Control group (Wilcoxon: Z=2.9, $p<.0005$)and the Phonological control group (Wilcoxon:Z=2.5, $p<.05$).

Does children's provision of contextual properties increase with increased exposure to the lexical items?

The children provided more "*contextual*" properties over time. Particularly, they provided significantly more "*contextual*" properties during post test 3 than during post test 1 (Wilcoxon: Z=2.5, $p<.05$). The Definition group provided significantly more "*contextual*" properties during post test 3 than during post test 1 (Wilcoxon: Z=2.1, $p<.05$).

Does the children's prior knowledge of the lexical items influence the provision of contextual properties?

Children provided more "*contextual*" properties for the partially represented words than for the unknown words, however, the differences were not significant.

Is the provision of contextual properties influenced by the semantic domain of the lexical items?

All the children provided more "*contextual*" properties for the words describing animals than for the words describing artifacts across testing. The differences were significant for post test 3 (Wilcoxon:Z=1.9, p<.05). Separate analysis for each one of the groups demonstrated the same pattern. Significant differences were found for the Definition group during post test 2 (Wilcoxon: Z=2.3, p<.05) and post test 3 (Wilcoxon: Z=2.5, p<.05).

Analysis of the "functional properties"

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of functional properties ?

No significant differences were found for post test 1, while, the differences were found to be significant for post test 2 (Kruskall-Wallis 1-Way Anova: X^2 = 19.9, df=2, p<.0000) and post test 3 (Kruskall-Wallis 1-Way Anova: X^2 = 28.03, df=4, p<.0000). Particularly, during post test 2 the Definition group provided significantly more "*functional*" properties than the Ostensive definition group (Wilcoxon:Z= 2.1, p<.05). During post test 3, the Definition group provided significantly more "*functional*" properties than the Control (Wilcoxon: Z = 3.5, p<.0005) the Phonological control group (Wilcoxon: Z =3.8, p<.0005), and the Ostensive definition group (Wilcoxon: Z= 3.9, p<.0005). In addition, the Lexical contrast group provided significantly more "*functional*" properties than the Control (Wilcoxon: Z=1.9, p<.05) the Phonological control group (Wilcoxon: Z=1.9, p<.05) and the Ostensive definition group (Wilcoxon: Z=2.02, p<.05). Lastly, the Definition group provided significantly more "*functional*" properties than the Lexical contrast group (Wilcoxon: Z=2.2, p<.05).

Does children's provision of functional properties increase with increased exposure to the lexical items?

The children during post test 3 provided significantly more functional properties than in post test 1 (Wilcoxon: Z=2.9, p<.005) and post test 2 (Wilcoxon: Z=2.1, p>.05).

Does the children's prior knowledge of the lexical items influence the provision of functional properties?

All the children provided more "*functional*" properties for the partially represented words than for the unknown words across testing. Significant differences were found for post test 1 (Wilcoxon: Z= 2.05, p<.05) and post test 3 (Wilcoxon: Z=2.6, p<.05). Separate analysis for each one of the groups demonstrated the same pattern, however, the differences were significant for the Lexical contrast (Wilcoxon: Z=2.03, p<.05) and for the Definition groups (Wilcoxon: Z=2.4, p<.05) during post test 3.

Is the provision of functional properties influenced by the semantic domain of the lexical items?

All the children provided significantly more "*functional*" properties for the words describing artifacts than for the words describing animals across testing (Wilcoxon: P1: Z=2.9, p<.005; P2: Z=2.8, p<.005; P3: Z=2.7, p<.0005). Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Definition group during post test 1 (Wilcoxon:Z=1.9, p<.05), for the Lexical contrast group during post test 2 (Wilcoxon: Z=2.02, p<.05) and post test 3 (Wilcoxon: Z=2.03, p<.05) and for the Definition group (Wilcoxon: Z=2.4, p<.05) during post test 3.

Analysis of the "semantic properties"

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of semantic properties ?

During post test 2, the Definition group provided significantly more "*semantic*" properties than the Ostensive definition group (Wilcoxon: Z=2.1, p<.05). The same was evident for post test 3 (Wilcoxon: Z=1.9, p<.05).

Does children's provision of semantic properties increase with increased exposure to the lexical items?

The children provided significantly more "*semantic*" properties during post test 3 than during post test 1 (Wilcoxon:Z=3.2, p<.005) and post test 2 (Wilcoxon:Z=2.3, p>.05). The analysis was repeated separately for each group. The same pattern (better in post test 3 than post test

1) was found for the Lexical contrast group (Wilcoxon: Z=2.03, p<.05) and the Definition groups (Wilcoxon: Z=2.5, p<.05).

Does the children's prior knowledge of the lexical items influence the provision of semantic properties?

No significant differences were found by the children's prior knowledge of the lexical items.

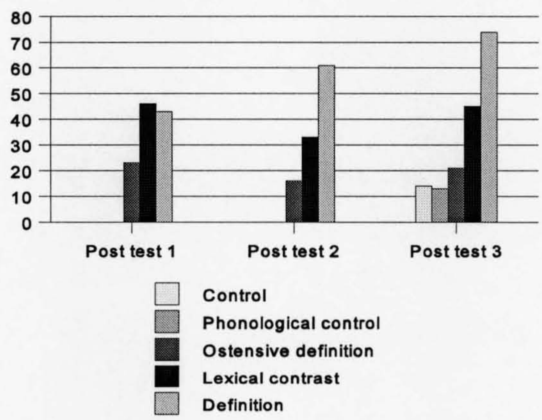
Is the provision of semantic properties influenced by the semantic domain of the lexical items?

No significant differences were found by the semantic domain of the lexical items.

Reference to the target word

During their story-tellings children referred to the target word in different ways. Each group could score a maximum of 104. The groups varied in their reference to the target words as the figure 7.35 shows.

Figure 7.35 Total number of reference to the target words by group across testing



As the previous figure shows the Definition and the Lexical contrast groups referred to the target words more than the other groups across testing. During post test 1, the Lexical contrast group referred to the target word significantly more times than the Ostensive definition group (Wilcoxon: Z=2.04, p<.05). Significant differences were found during post test 2 (Kruskall-Wallis 1-Way Anova: $X^2 = 13.6$, df = 2, p<.005) and post test 3 (Kruskall-Wallis 1-Way Anova: $X^2 = 32.6$, df=4, p<.0000). Particularly, during post test 2 the Definition group referred to the target words significantly more times than the Ostensive definition (Wilcoxon: Z=3.5, p<.0005) and Lexical contrast groups (Wilcoxon: Z=2.2, p<.05).

During post test 3, the Definition group referred to the target words significantly more times than the Control (Wilcoxon: Z=4.3, p<.0000) the Phonological Control (Wilcoxon: Z= 4.4, p<.0000) and the Ostensive definition groups (Wilcoxon: Z=3.9, p<.0005). In addition, the Lexical contrast group referred to the target words significantly more times than the Control (Wilcoxon: Z=2.4, p<.05) and the Phonological control groups (Wilcoxon: Z=2.4, p<.05). No significant differences were found between the Control groups, as well as between the Control groups and the Ostensive definition group.

Types of reference to the target words

How children referred to the target words during their story-tellings was investigated. Four different types of reference were identified: (a) *Use of the target word*: e.g "One day the ostrich went to the forest...."; (b) *Use of a synonym*: e.g. "There was a long spoon and a little lady makes a soup...."; (c) *Use of pronouns*: e.g. "This is in the kitchen....."; (d) *Use of other references*: e.g. "The thing is in the kitchen....) Table 7.18 presents which types of references children used.

Table 7.18 Distribution of children's references to the target word during the story task

	Post test 1		Post test 2		Post test 3	
	%	**n**	**%**	**n**	**%**	**n**
No reference	64.1	200	64.7	202	68	353
Target	22.7	71	26	81	25.2	131
Synonym	5.1	16	2.6	8	2.6	14
Pronouns	7.1	22	4.8	15	2.5	13
Other	1	3	1.9	6	1.7	9
N of responses		312		312		520

Most of the children did not refer to the target words. However, when they did refer to the target words they mostly used the target word across testing. Statistical analysis revealed that across testing they referred to the target item by using the target word significantly more frequently than the synonyms (Wilcoxon: P1: Z= 4.1, p<.0000; P2: Z= 4.5, p<.0000; P3: Z

= 5.6, $p<.0000$) and the pronouns (Wilcoxon: P1: $Z=3.2$, $p<.005$; P2: $Z=3.9$, $p<.0005$; P3: $Z = 5.2$, $p<.0000$).

Analysis of the "target word" reference

Is there a differential impact of the type of exposure to new lexical items that the children receive to referring to the target items by using the target word?

The Definition group referred to the target items by using the target words significantly more times than the other groups during post test 2 (Kruskall-Wallis 1-Way Anova: $X^2 = 11.1$, df=2, $p<.005$) and post test 3 (Kruskal-Wallis 1-Way Anova: $X^2 = 24.9$, df=4, $p<.0005$). Particularly, it was found that during post test 2, the Definition group used the target words significantly more frequently than the Ostensive definition group (Wilcoxon: $Z=3.2$, $p<.005$).

Last, during post test 3, the Lexical contrast group used the target words significantly more frequently than the Control (Wilcoxon: $Z=2.4$, $p<.05$) and the Phonological control groups (Wilcoxon: $Z=2.1$, $p<.05$). In addition, the Definition group used the target words significantly more times than the Control (Wilcoxon: $Z=4.01$, $p<.0005$) the Phonological control (Wilcoxon: $Z=3.7$, $p<.0005$) and the Ostensive definition groups (Wilcoxon: $Z=3.2$, $p<.005$).

Does children's use of the target word for referring to the target item increase with increased exposure to the lexical items?

The target word was used significantly more times in post test 3 than in post test 2 (Wilcoxon: $Z=2.07$, $p<.05$) and post test 1 (Wilcoxon: $Z=2.7$, $p<.005$). The analysis was repeated separately for each group. It was found that the Lexical contrast group used the target word in the stories significantly more frequently during post test 2 than post test 1 (Wilcoxon: $Z=2.3$, $p<.05$) and in post test 3 than in post test 2 (Wilcoxon: $Z=1.9$, $p<.05$). In addition the Definition group used the target word significantly more frequently during post test 2 than during post test 1 (Wilcoxon: $Z=2.2$, $p<.05$) and significantly more frequently during post test 3 than during post test 1 (Wilcoxon: $Z=2.9$, $p<.005$).

Does the children's prior knowledge of the lexical items influence the use of target words when referring to the target items ?
Statistical analysis revealed no significant differences by the children's prior knowledge.

Is the use of target words influenced by the semantic domain of the lexical items?
The children used the target words more when referring to words describing animals than to words for describing artifacts across testing. The differences were significant for post test 1 (Wilcoxon: $Z=2.3$, $p<.005$) and post test 3 (Wilcoxon: $Z= 3.6$, $p<.0005$). The same pattern was found for each one of the groups. The differences were significant for the Lexical contrast group during post test 3 (Wilcoxon: $Z=2.2$, $p<.05$) and the Definition group during post test 1 (Wilcoxon: $Z=2.5$, $p<.05$).

Key findings from the story generation task

Is there a differential impact of the type of exposure to new lexical items that the children receive to the provision of stories?

- The provision of stories differed significantly by the type of exposure during post tests 2 and 3. The Definition group provided significantly more stories than the Ostensive definition and the Lexical contrast group during post test 2. During post test 3, the Lexical contrast group provided significantly more stories than the Control and Phonological control groups. In addition, the Definition group performed significantly better than the two Control and Experimental groups. No significant differences were found between the two Control groups and the Ostensive definition group in any of the post tests.

Does children's provision of stories increase with increased exposure to the lexical items?

- The children provided significantly more stories in post test 3 than in post test 1.

Does the children's prior knowledge of the lexical items influence the provision of stories?

- Children's provision of stories did not differ significantly by their prior knowledge of the lexical items.

Is the provision of stories influenced by the semantic domain of the lexical items ?

- During post test 3 the children provided significantly more stories for the target words describing artifacts than for the words describing animals. The same pattern was found for the Lexical contrast and Definition groups.

To what extent does the child's prior lexical knowledge (Comprehension and Naming) influence the provision of stories ?"

Baseline Comprehension Vocabulary

- Children with high level baseline comprehension vocabulary provided significantly more stories than children with low level baseline comprehension vocabulary across testing. Significant differences were found during post test 3. Separate analysis for each group demonstrated the same pattern. Significant differences were found for the Definition group during post test 1.

Baseline Naming Vocabulary

- Children with high level of baseline naming vocabulary provided significantly more stories than children with low level baseline naming vocabulary during post test 2 and post test 3. Separate analysis for each group revealed the same pattern. However, the differences were not significant

Analysis of the stories

- Children in their stories mentioned different properties of the target word. These were descriptive, contextual, functional and semantic.

"Descriptive properties"

Is there a differential impact of the type of exposure to new lexical items that the children receive to the provision of descriptive properties?

- No significant differences were found during post tests 1 and 3. During post test 2, the Definition group provided significantly more "*descriptive*" properties than the Ostensive definition and Lexical contrast groups.

Does children's provision of descriptive properties improve with increased exposure to the lexical items ?

- No significant differences were found over time.

Does the children's prior knowledge of the lexical items influence the provision of descriptive properties ?

- The provision of "*descriptive*" properties did not differ by the children's prior knowledge of the lexical items.

To what extent does the provision of descriptive properties differ by semantic domain ?

- No significant differences as a function of the semantic domain were found.

"Contextual properties"

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of contextual properties ?

- No significant differences were found for post tests 1 and 2. Significant differences were found for post test 3. During post test 3, the Definition group provided significantly more "*contextual*" properties than the Control and Phonological control groups.

Does children's provision of contextual properties increase with increased exposure to the lexical items?

- Children provided significantly more "*contextual*" properties in post test 3 than post test 1. The Definition group provided significantly more "*contextual*" properties during post test 3 than post test 1.

Does the children's prior knowledge of the lexical items influence the provision of contextual properties ?

- There was a trend for the children to provide more "*contextual*" properties for the partially represented words than the unknown words.

Is the provision of contextual properties influenced by the semantic domain of the lexical items?

- All the children provided more "*contextual*" properties for the words describing animals than for the words describing artifacts across testing. The differences were significant for post test 3. The same pattern was found for each group. The differences significant for the Definition group during post tests 2 and 3.

"Functional properties"

Is there a differential impact of the type of exposure to new lexical items that the children receive on the provision of functional properties?

- No significant differences were found for post test 1, while significant differences were found for post tests 2 and 3. During post test 2 the Definition group provided significantly more "*functional*" properties than the Ostensive definition group.

- During post test 3 the Definition group provided significantly more "*functional*" properties than the Control and the Ostensive definition groups. In addition, the Lexical contrast group provided significantly more "*functional*" properties than the Control and the Ostensive definition groups. Lastly, the Definition group provided significantly more "*functional*" properties than the Lexical contrast groups.

Does children's provision of functional properties increase with increased exposure to the lexical items?

- The children provided significantly more "*functional*" properties during post test 3 than post tests 1 and 2.

Does the children's prior knowledge of the lexical items influence the provision of functional properties?

- During post test 1 and post test 3 the children provided more "*functional*" properties for the partially represented words than the unknown words. The same pattern was significant for the Lexical contrast and the Definition groups during post test 3.

Is the provision of functional properties influenced by the semantic domain of the lexical items?

- All the children provided significantly more "*functional*" properties for the words describing artifacts than for the words describing animals across testing. The same pattern was found to be significant for the Definition and Lexical contrast group during post tests 1 and 3.

"Semantic properties"

Is there a differential impact of the type of exposure to new lexical items that the children receive to the provision of semantic properties?

- During post test 2, the Definition group provided significantly more "*semantic*" properties than the Ostensive definition group. The same pattern was evident for post test 3.

Does children's provision of semantic properties increase with increased exposure to the lexical items ?

- The children provided significantly more "*semantic*" properties during post test 3 than post tests 1 and 2.

Does the children's prior knowledge of the lexical items influence the provision of semantic properties?

- No significant differences were found in the provision of "*semantic*" properties by the children's prior knowledge of the lexical items.

Is the provision of semantic properties influenced by the semantic domain of the lexical items?

- No significant differences were found as a function of the semantic domain.

Reference to the target word

- The Lexical contrast and Definition groups referred to the target words significantly more frequently than the other groups. Furthermore, the children referred to the target items by using the target word, or a synonym, or a pronoun.

- In general, the children used significantly more the target word than the other types of reference when referring to the target word.

Is there a differential impact of the type of exposure to new lexical items that the children receive on the reference to the target item by using the target word ?

- The Definition group used the target words significantly more times than the other groups during post test 2 and 3.
- During post test 2, again the Definition group used significantly more times the target word than the Ostensive definition group. During post test 3, the Lexical contrast group used the target word significantly more than the Control groups. In addition, the Definition group used the target word significantly more than the two Control and the Ostensive definition groups.

Does children's use of the target word increase with increased exposure to the lexical items?

- The children used the target word in post test 3 significantly more times than in post tests 2 and 1.

Does the children's prior knowledge of the lexical items influence the use of target word ?

- No significant differences were found.

Is the use of the target word influenced by the semantic domain of the lexical items ?

- The children used the target word significantly more frequently when referring to words describing animals than to words describing artifacts during post test 1 and post test 3. The same pattern was found for each one of the groups. The differences were significant for the Lexical contrast group during post test 3 and the Definition group during post test 1.

Concluding remarks for the Story generation task

- The analysis of the story generation task revealed that the Definition group performed better than the other groups. Children also performed better over time. No significant differences were found by children's prior knowledge of the lexical items. On the other hand, during post test 3 the children provided more stories for the target words describing artifacts than animals. Additionally, children with high level baseline comprehension and naming vocabulary provided more stories than children with low level baseline comprehension and naming vocabulary.

- Children during their stories mentioned different properties (descriptive, functional, contextual and functional) for the target words. The Definition group provided more of the above properties than the other groups. No significant differences were found in the provision of "*descriptive*" properties over time. On the other hand, children provided more "*contextual*", "*functional*" and "*semantic*" properties over time. The provision of "*descriptive*" and "*semantic*" properties did not differ by children's prior knowledge of the lexical items and by the semantic domain of the target words. On the other hand, children provided more "*contextual*" and "*functional*" properties for the partially represented than the unknown words. Moreover, they provided more "*contextual*" properties for the words describing artifacts than animals.

- Children from the Definition and Lexical contrast groups referred to the target words significantly more frequently than the other groups. They referred to the target word by using the target word or a synonym or a pronoun. Overall, they mostly used the target than the other types of words. Again the Definition group used more frequently the target words than the other groups. Moreover, all the children performed better over time by using the target word as a way of reference. No significant differences were found in children's use of the target word as a way of reference by their prior knowledge of the lexical items. On the other hand, the children used the target word more frequently when referring to animals than to artifacts.

7.4.3 Overall word learning and between measures comparison

7.4.3.1 Is there a differential impact of the type of exposure to new lexical items that the children receive on the overall word learning ?

In the previous analyses children's word learning was investigated by analysing children's performance in each task separately. In this subsection, children's word learning was investigated by exploring their performance in all the post test tasks. A composite score was constructed to investigate the previous question. Each child could score a maximum of 32 (8 tasks * 4 items).

Three One Way Analyses of Variance were carried out, with group as the independent variable and the composite score for word learning as the dependent variable. Children's word learning varied significantly by the type of exposure across testing [P1: $F(2,75) = 10.2$, $p<.0005$];[P2: $F(2,75) = 39.3$, $p<.0000$]; [P3: $F(4,125) = 38.1$, $p<.0000$]. Table 7.19 presents the means by group across testing.

Table 7.19 Children's overall word learning (means & sds) by group across testing

	Post test 1		Post test 2		Post test 3	
Control					12.4	(5.3)
Phono.Control					14.3	(5.6)
Oste. Definition	13.04	(4.7)	13.5	(4.6)	16.04	(5.9)
Lex.Contrast	16.1	(4.6)	18.5	(4.9)	21.6	(4.2)
Definition	18.6	(3.8)	24.2	(3.1)	26.7	(2.1)

Post-hoc analysis for post test 1 revealed that the Definition and the Lexical contrast group performed significantly better than the Ostensive definition group. Post-hoc analysis for post test 2 revealed the same pattern as before as well as that the Definition group performed significantly better than the Lexical contrast group.

During post test 3, no significant differences were found between the Control and Phonological control group as well as between the Phonological control and the Ostensive definition group. On the other hand, the Control group performed significantly worse than the Ostensive definition (Wilcoxon: $Z=2.03$, $p<.05$), the Lexical contrast (Wilcoxon: $Z=5.1$, p<.0000) and the Definition groups (Wilcoxon: Z=6.1, p<.0000). The Phonological control group also performed significantly worse than the Lexical contrast group (Wilcoxon: Z=4.4, p<.0000) and the Definition groups (Wilcoxon: Z=6.1, p<.0000). The Ostensive definition group performed significantly worse than the Lexical contrast group (Wilcoxon: Z=3.4, p<.005) and the Definition groups (Wilcoxon: Z=5.7, p<.0000). Lastly, the Definition group performed significantly better than the Lexical contrast group (Wilcoxon: Z=4.2, p<.0000).

Three analyses of covariance were carried out to see whether these differences would remain significant when existing vocabulary was controlled for in each one of the post tests. The covariates were the existing naming and comprehension vocabulary (scores), the independent variable was group (Control , Phonological control, Ostensive definition, Lexical contrast, Definition)[1] and the dependent variable was the composite score on word learning.

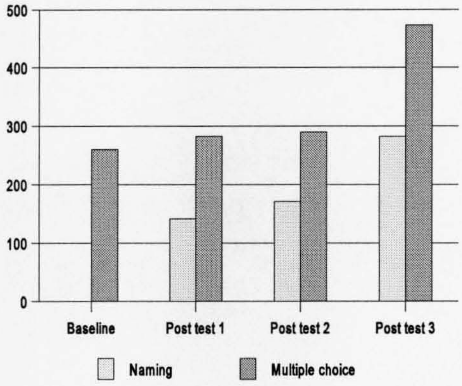
For post test 1 there was a significant effect of group (F=5.1, df=2, p<.05), showing that the Definition group still performed better than the other groups, even when existing naming and comprehension vocabulary were controlled for. The same pattern was found for post tests 2 and 3, with group having still a significant effect (P2: F=28.6, df=2, p<.000; P3:F=32.29, df=4, p<.000).

7.4.3.2 Is there any difference between children's performance on the baseline and post test comprehension and naming of the target words ?

Children's knowledge of the target words was compared between their baseline and post tests comprehension and naming tasks to investigate any changes that took place. As Figure 7.36 shows the children's knowledge (receptive and expressive) of the target words was higher in the three post tests than the baseline tests. In addition, across testing they performed better in the naming than the multiple choice task.

[1]For post test 1 and 2 only the last three groups were included in the group variable.

Figure 7. 36 Total number of correct responses in the baseline and post tests naming and multiple choice tasks



Statistical comparison revealed that all the children performed significantly better on the post test naming than the baseline naming task for the target words (Friedman Two-Way Anova: X^2 = 125, df=3, p<.0000). The same pattern was found for each group separately: [(Control group: Z=3.5, p<.0005); (Phonological control group: Z=4.01, p<.0005); (Ostensive definition group: X^2 =35.2, df=3, p<.0000); (Lexical contrast group:X^2 =44.6, df=3, p<.0000;(Definition group:X^2 =47.2, df=3, p<.0000)].

Children also performed significantly better on the post test multiple choice than the baseline multiple choice task for the target words (Friedman Two-Way Anova: X^2 = 117, df=3, p<.0000). The same pattern was found for each group [(Control Group Z=3.4, p<.0005); (Phonological control group Z= 3.8, p<.0005); (Ostensive definition group X^2 = 27.9, df=3, p<.0000); (Lexical contrast group X^2 = 43.4, df=3, p<.0000); (Definition group X^2 = 47.2, df=3, p<.0000)].

7.4.3.3 Is there any correlation between children's performance on the multiple choice and naming task ?

A series of bivariate correlations were carried out to investigate whether children's performance on the multiple choice task was correlated with their performance on the naming task. The analysis demonstrated significant correlations between children's performance on the two tasks across testing except for post test 1 (see Appendix 7.8 for correlations).

7.4.3.4 Is there any correlation between children's performance on the naming and the other understanding tasks?

A series of bivariate correlations were carried out to investigate the above question. It was found that during post test 1, children's performance on the naming task was significantly correlated with their performance on the "*world knowledge*" questions. During post test 2 their performance on the naming task was significantly correlated with their performance on the contrast, definition, "*categorisation*" questions and story generation task. Last, during post test 3 children's performance on the naming task was significantly correlated with their performance on all the other understanding tasks (see Appendix 7.9 for correlations).

7.4.3.5 Is there any correlation between children's existing vocabulary knowledge (expressive and receptive) and their performance on the naming and multiple choice tasks?

A series of bivariate correlations were carried out between children's existing expressive and receptive vocabulary and performance on the multiple choice and naming task across testing. It was found that children's performance on the naming and multiple choice tasks was significantly correlated with their existing vocabulary knowledge (expressive and receptive) (see Appendix 7.10 for correlations).

7.4.3.6 Is there any relation between children's prior lexical knowledge by semantic domain and the acquisition of the target words

Whether there was any correlation between children's existing lexical knowledge (by semantic domain) and their performance on the relevant target words was investigated. A series of bivariate correlations were carried out between children's existing knowledge for animals and their overall performance on the acquisition of the target words describing animals across tasks as well as between children's existing knowledge for artifacts and their performance on the acquisition of the target words describing artifacts.

It was found that children's existing vocabulary knowledge for animals (expressive and receptive vocabulary) was positively correlated with the acquisition of the target words describing animals as this was measured by most of the measurements. On the other hand, children's existing vocabulary knowledge for artifacts was not related to the acquisition of the target words describing artifacts to the same degree (for more details see Appendices 7.11 and 7.12).

7.4.3.7 Comparing children's performance across the post test measurements

Children's performance across the seven post test measurements was compared. The responses that were counted as correct for each task are the following:

(a) Naming task: accurate naming of the target words

(b) Multiple choice task: accurate pointing of the target words

(c) Association task: provision of perceptual, semantic and thematic justifications

(d) Contrast task: provision of semantic contrasts for the target words

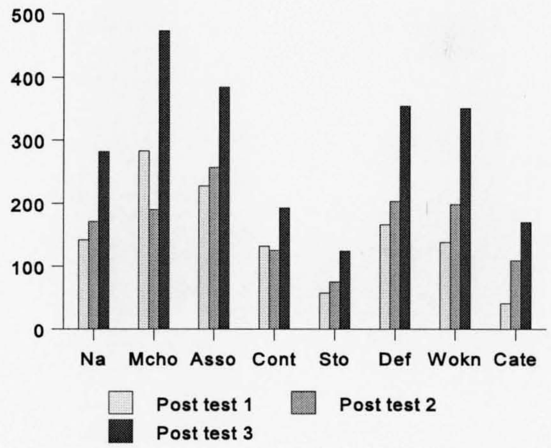
(e) Story task: provision of appropriate stories for the target words

(f) Definition task: provision of appropriate definitions

(g) Short questions: provision of accurate choice patterns for the target words.

Figure 7.37 below shows children's performance across the different post test measurements. As the figure shows children's performance varied by type of measurement across testing. Children performed better on the multiple choice, short questions (world knowledge questions), association and definition tasks than the naming, contrast, story generation and short questions (categorisation questions) tasks.

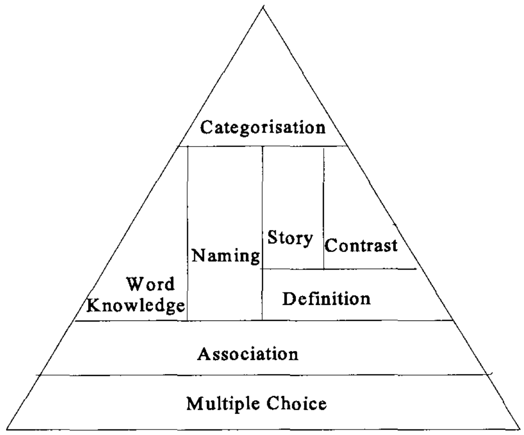
Figure 7.37 Total number of correct responses across tasks over time



Three Friedman Two Way Anovas were carried out to explore whether the differences were significant. Significant differences in children's performance across tasks were found (P1:

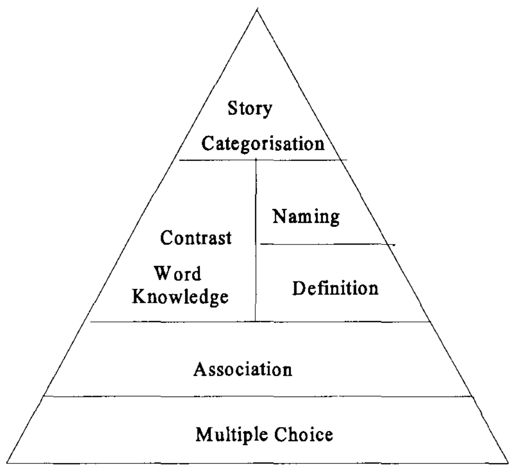
$X^2 = 190.4$, df = 7, p<.0000; P2: $X^2 = 158.2$, df = 7, p<.0000; P3: $X^2 = 276.5$, df = 7, p<.0000). In addition separate Wilcoxon between tasks were carried out. The significant differences between tasks for post test 1 are presented on Diagram 7.11.

Diagram 7.11 Pattern of success across tasks during post test 1



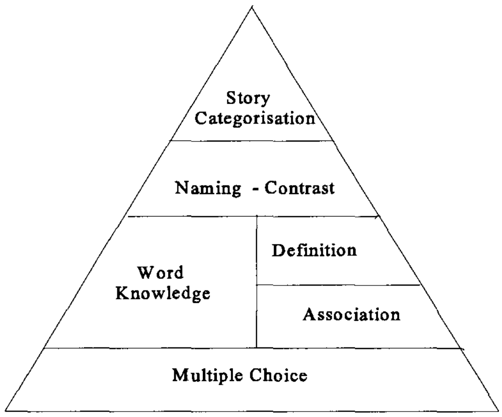
As the above diagram shows, during post test 1 the children performed significantly better on the multiple choice than all the other tasks. They performed significantly better on the association task than the other tasks. In addition they performed significantly better on the definition than the contrast, story generation and short questions (categorisation questions). They performed significantly better on the short questions (world knowledge) naming, contrast and story generation task than the short questions (categorisation questions) (see Table in Appendix 7.13 for the statistical comparisons). The following diagram presents children's success on the tasks during post test 2.

Diagram 7.12 Pattern of success across tasks during post test 2



As the above diagram shows, during post test 2 the children performed significantly better on the multiple choice than the other tasks. They performed significantly better on the association task than the other tasks. In addition they performed significantly better on the definition than the contrast task. They performed significantly better on the contrast and short questions (world knowledge questions) than the short questions (categorisation questions) and story generation task (see Table in Appendix 7.14 for statistical comparisons).The following Diagram presents children's success in the tasks during post test 3.

Diagram 7.13 Pattern of success across tasks during post test 3



During post test 3 the children performed significantly better on the multiple choice than the other tasks. They performed significantly better on the association task than the other tasks. In addition, they performed significantly better on the short questions (world knowledge questions) than the naming, contrast, short questions (categorisation questions) and story generation task. They performed significantly better on the definition than the rest of the tasks. They performed significantly better on the naming and contrast than the short questions (categorisation questions) and story generation task (see Table in Appendix 7.15 for the statistical comparisons).

Key findings from the overall word learning analysis and the between measures comparison

Is there a differential impact of the type of exposure to new lexical items that the children receive on their overall word learning ?

- Children's word learning varied significantly by the type of exposure across testing. The Definition and Lexical contrast groups performed significantly better than the Ostensive definition group during post test 1. During post test 2 the same pattern was found as well as that the Definition group performed significantly than the Lexical contrast group. In post test 3, the experimental groups performed significantly better than the Control group. Also, the Lexical contrast and Definition group performed significantly better than the Ostensive definition group, and the Definition group performed significantly better than the Lexical contrast group.

- The differences remain significant across testing even when children's existing naming and comprehension vocabulary were controlled for.

Is there any difference between children's performance on the baseline and post test comprehension and naming of the target words ?

- The children performed significantly better on the post test than the baseline comprehension and naming of the target words. The same pattern was found for each group.

Is there any correlation between children's performance on the multiple choice and the naming task ?

- Significant correlations were found between children's performance on the multiple choice and naming tasks across testing except for post test 1.

Is there any correlation between children's performance on the naming and the other understanding tasks?

- During post test 1 children's performance on the naming task was significantly correlated with their performance on the "world knowledge questions", during post test 2 performance on the naming task was significantly correlated with their performance on the contrast, definition, "categorisation questions" and story generation tasks. During post test 3 children's performance on the naming task was significantly correlated with their performance on all the other understanding tasks.

Is there any correlation between children's existing vocabulary knowledge (expressive and receptive) and their performance on the naming and multiple choice tasks ?

- Children's performance on the naming and multiple choice tasks was significantly correlated with their existing vocabulary knowledge (expressive and receptive).

Is there any relation between children's prior lexical knowledge by semantic domain and the acquisition of the target words ?

- Children's existing vocabulary knowledge for animals was positively correlated with the acquisition of the target words describing animals. On the other hand, children's existing vocabulary knowledge for artifacts was not related to the acquisition of the target words describing artifacts.

Comparing children's performance across the post test measurements

- Children's performance varied by the type of measurement across testing. In general they performed significantly better on the multiple choice and association tasks. They performed at a lower level on the "World knowledge questions", naming, definition and contrast tasks. The worst performance was observed on the "Categorisation questions" and the story generation tasks.

7.5 Overall Conclusions and Discussion of Experiment 2

Experiment 2 was designed to extend our understanding of the lexical acquisition process from listening to stories by overcoming the limitations of Experiment 1 as well as by introducing new factors under investigation. In that way, the lexical acquisition process was explored in more depth and as it occurs in naturalistic situations.

Specifically, Experiment 2 investigated the role of child based factors (prior lexical knowledge of two semantic domains and prior knowledge of the target lexical items) in relation to the nature of the lexicon (semantic domain of the target words) and the nature of the input (children's repeated exposure to various linguistic contexts). The results revealed that children can benefit from repeated exposure to various linguistic contexts which provide them with explicit information about the word's meaning. It was also found that children's word learning varies by their prior lexical knowledge, the prior knowledge of the lexical items as well as the semantic domain of the target words and the type of measurement. The main findings of Experiment 2 are discussed into detail in the following paragraphs.

A. Children can benefit from repeated exposure to various linguistic contexts

Experiment 2 demonstrated that children can benefit from repeated exposure to various linguistic contexts which provide explicit information about the word's meaning. Particularly, it was found that the Definition group performed significantly better across tasks than the other groups. The Lexical contrast group was the second type of group that performed quite well. On the other hand, poorest performance was observed in the Ostensive definition, Phonological control and Control groups. This can be explained by the fact that prior to the final test, these three groups had no information about the denotation of the new terms and virtually no information about the sense of the new term's word meaning.

A possible explanation for the Definition group's best performance is that children of that age (5.00-6.00 year olds) can benefit from exposure to explicit information about the novel words. Also, the Lexical contrast group performed better than the other groups except from the Definition group because children from that group were exposed to more additional information about the target word's meaning than the other three groups (Control, Phonological control and Ostensive definition group).

The above explanation is in accordance with the Sternberg and Powell's (1984) theory of word learning from context according to which the children can benefit from contextual cues and mediated variables in order to infer the meanings of the novel words. For example, the children from the Definition group, during the second week of the intervention, were exposed into a context which included various contextual cues, such as stative descriptive cues (cues regarding physical properties), functional descriptive cues (cues regarding possible purposes of x, actions x can perform, or potential uses of x), class membership cues (cues regarding one or more classes to which x belong). Additionally, the Lexical contrast group children, during the second week of the intervention, were exposed into a context which included some contextual cues, such as spatial cues (cues regarding the general or specific location that the x can be found). On the other hand, the Ostensive definition, Phonological control and Control groups were not exposed to any contextual cues which justifies their worse performance.

B. Children performed better over time- Children's representations change over time

Children's performance varied across sessions. Particularly, it was found that children performed better over time on the naming, definition, short questions and story generation tasks. No significant differences over time were found in children's performance on the multiple choice task, provision of justifications in the association task and provision of contrasts in the contrast task.

Differential input had an impact on children's performance to almost all the tasks. This appears to result from the fact that they used the information they were exposed to either because the information were more salient or it was easier for them to encode, or they were less distracted. On the other hand, no significant differences over time were found in children's performance on the other tasks (e.g. multiple choice task, for which the same pattern was found as in Experiment 1-ceiling effect from the first measurement), probably because children could succeed on them easily using very few information without any need for more information from various linguistic contexts.

Furthermore, the qualitative analysis of some tasks (definition, association, story generation) demonstrated changes over time regarding the properties the children focus on. For example, it was found that in general, children provided more descriptive, functional, semantic properties over time for the definition task. They also provided more semantic, functional and contextual properties over time on the story generation task. Separate analysis for each group demonstrated that the above findings were significant for the definition group. On the other hand, they provided less descriptive properties over time in their justifications for the association task. The above findings demonstrate that the children benefited from the repeated exposure to various contexts over time, since they provided more properties over time, gaining a full understanding of the word's meaning.

C. Children's word learning varies by their prior knowledge of the target words

Experiment 2 demonstrated that children's word learning performance varied by their prior knowledge of the target words. Particularly, it was found that if the children had a partial representation for the target words, then children were better able to learn their name (naming task), to define them (definition task) and to classify them in a category (world knowledge questions) than if they had not any prior knowledge for them.

Children's success on the above tasks could be related with the three different aspects of the word's meaning -reference, denotation and sense- (Lyons, 1977). The above findings suggest that when the children have already acquired the denotation or part of the denotation of a word's meaning (success in the multiple choice task for the partially represented words) they can then easier extend the acquisition of the denotation of the word (success on the naming task) and acquire the also the sense of the word's meaning (success on the definition and short questions task). This is not the case when the words are totally unknown for the children.

Thus, a theory of word learning needs to take into account the three aspects of the words' meaning (reference, denotation, sense) since knowledge of one of them can support the acquisition of any of others. The above suggestion is also in accordance and extend Dockrell and Campbell's (1986) proposal that the three aspects of the word's meaning -reference, denotation and sense- can provide a framework for the study of the word's meaning acquisition.

D. Children's word learning varies by the semantic domain the target words belong to

Experiment 2 demonstrated that word learning varies by the semantic domain the target words belong to. Particularly, the qualitative analysis of the association, definition and story generation tasks demonstrated that the children focused on perceptual/descriptive, functional and contextual properties for the target words describing animals, whereas, they focused mostly on semantic properties for the target words describing artifacts. On the other hand, no significant differences by semantic domain were found for the multiple choice, categorisation questions and contrast task.

A possible interpretation for the above findings may be that the children are sensitive to semantic domain differences (Sainsbury, 1991). It is likely that the artifacts domain has more clear-cut boundaries than the animal domain, therefore the children are able to focus on the semantic properties of the items from that domain. On the other hand, the animal domain may not have clear-cut boundaries, therefore the children cannot focus on their semantic properties. Instead they focus on the perceptual/descriptive and contextual properties. Focus on such properties is also related with the experience the children already have with them from everyday life.

Differences in word learning by the semantic domain were also found in the naming task. Particularly, it was revealed that the children produced accurately more words describing animals than artifacts. A possible explanation for the above performance may be that the semantic domain for animals was more well-established, so it was easier for the children to accommodate the new animal words. That explanation is also supported by the statistical analysis, which showed that children's prior lexical knowledge for animals was significantly correlated with accurate naming of the target words describing animals across testing. The above findings imply that a theory of word learning from context needs to take into account the semantic domain the target words belong, since children's focus and the information they acquire varies according to the semantic domain.

E. Children's word learning varies by their prior lexical knowledge

Experiment 2 revealed that children's performance on the word learning tasks differed by their prior lexical knowledge. Particularly, it was found that children with high expressive prior lexical knowledge performed significantly better than children with low expressive prior lexical knowledge across tasks. Additionally, the children with high receptive prior lexical knowledge performed also better across tasks than the children with low receptive lexical knowledge. However the above pattern was characterised by a trend for significance for most of the tasks except for the definition task, categorisation questions and story generation task.

The above findings implies that children's expressive prior lexical knowledge is more crucial for acquiring the full meaning of a word than their receptive prior lexical knowledge. It is probable that expressive prior lexical knowledge is more important for word learning than the receptive one because the first may reflect more advanced levels of word knowledge (see triangles at section 7.4.3.6) which can foster novel word learning more than the receptive one which probably reflects less advanced levels of word knowledge.

F. Children's word learning varies by the type of measurement

Children's performance was found to vary across the post test measurements and across testing. It was found that the children performed better on the multiple choice than the other tasks. Then they performed significantly better on the association task than the rest of the tasks. Success in the naming, definition, contrast and "world knowledge questions" tasks follows. Lastly, the worst performance was observed on the story generation and "categorisation questions". The above findings were evident across testing.

The different measurements used in Experiment 2 tapped on various aspects of word meaning such as the reference, sense and denotation. Similarly as in Experiment 1, the results of Experiment 2 demonstrated that although the children showed that they had acquired some sense of the word's meaning (success in the multiple choise task), their understanding of the denotation (suceess in the naming, definition, "world knowledge questions" tasks) of the target words was at lower levels. In general, the across tasks analysis demonstrated that children's acquisition of the three different aspects of the words' meaning varied by the type of measurement.

Chapter 8:
DISCUSSION & CONCLUSIONS

8.1 Introduction

The broad conclusions that may be drawn from this research are summarised and discussed in the present chapter. Particularly, the chapter includes a summary of the most important findings, discussion of the important parameters for lexical acquisition and issues on measuring word knowledge. The chapter concludes with a proposal towards a model of lexical acquisition in context. At the end of the chapter, implications for lexical acquisition, as well as the main limitations of the present study and suggestions for future work, are presented.

8.2 Summary of the findings

The present thesis includes a series of two experiments, designed to explore lexical acquisition from listening to stories. Experiment 1 was designed to investigate how a single exposure to different linguistic input in relation to the children's age, phonological working memory and existing vocabulary (receptive) knowledge affects the acquisition of novel words. Experiment 2, which was developed from Experiment 1, aimed to investigate how repeated exposure to combinations of different linguistic contexts in relation to children's prior lexical knowledge (receptive and expressive), semantic domain and prior knowledge of the target words contribute to the acquisition of novel lexical items. For the purposes of both experiments, a series of multiple measures of lexical knowledge was developed and used.

The analysis of the two experiments, which was both quantitative and qualitative, demonstrated that different parameters take part in lexical acquisition. These were identified as the *child based factors* such as: child's age, phonological memory, prior vocabulary knowledge; the *nature of the lexicon* such as: semantic domain and prior knowledge of the target words and the *nature of the input*, such as linguistic context. Issues on measuring word knowledge as well as the discrepancy between comprehension and production were also raised.

8.3 Parameters contributing to Lexical acquisition

8.3.1 Child based factors

The child based factors shown as playing a key role in lexical acquisition from context were children's age, their phonological memory, their existing vocabulary (receptive) knowledge and prior lexical knowledge (receptive and expressive) as well as their prior knowledge of the lexical items. The main patterns identified are discussed in the following subsections.

8.3.1.1 Children perform better in the lexical tasks as they get older

Age was found to be an important factor for lexical acquisition. Experiment 1 demonstrated that the older age group children performed better across tasks than their younger age counterparts. The pattern was still the same, even when age was covaried for vocabulary and memory scores. Unfortunately, little empirical information is available regarding different processes used at differing age levels, because very few studies span even two age groups. Nevertheless, age related differences in word learning have been documented by Crais (1987) as well as by Heibeck and Markman (1987). However, both studies included different age groups from the present study.

Nelson (1988) claims that distinct problems are encountered within each period therefore, differing processes of acquisition should be expected at each developmental level. These developmental differences may be due to different factors. It is probable, that the older children have more experience with the world which helps them organise better and acquire more easily and efficiently the incoming new information. This interpretation is also supported by Mervis (1987) and Neisser (1987) who found that children as they get older, increase their ability to process purely verbal input. Furthermore, Vallian and Eisenberg (1996) argued that all the children in their study had a limited performance system that became progressively less limited as development proceeds.

Another possible explanation could be that different comprehension strategies are employed at different age ranges which have not yet matured for the youngest group. It is also probable that the younger children have less experience of listening to stories and therefore attended to the overall plot rather than to new words. It may be also, that the younger age group children were less interested in or motivated to infer the meanings of the new words. Thus, Experiment 1 extended our understanding of these factors by demonstrating that they interrelate with the linguistic input the children are exposed to and the type of the lexical tasks word knowledge is assessed.

8.3.1.2 Phonological working memory is involved in word learning: It predicts production but not comprehension of the novel words

As Gathercole et.al. (1997) claims, learning one's native language clearly involves acquiring not only the semantic properties of the new word but the phonological properties as well. Experiment 1 supported the above claim by demonstrating that the phonological memory is an important parameter for lexical acquisition. Particularly, it was found that the children with high phonological memory performed better than the children with low phonological memory in almost all the tasks.

There is a growing body of other evidence indicating the involvement of phonological memory in children's vocabulary acquisition as was measured mainly by a naming task. Gathercole and Baddeley (1990) found that the low repetition children were slower at learning phonologically unfamiliar names such as "*Pimas*" for the toys than the high repetition children. Moreover, Michas and Henry (1994) found that phonological memory was a significant predictor of the ability to learn explicitly taught new words. However, it did not predict word learning for the incidentally introduced words. Furthermore, Gathercole, Service, Hitch and Martin (1997) found that the phonological memory play a significant role in the long-term learning of the sounds of new words.

The results of Experiment 1 in relation to other findings demonstrate that immediate memory processes are directly involved in the learning of new vocabulary items in young children. One possible interpretation for the relationship between non-word repetition and vocabulary acquisition reflects the contribution to both skills of the phonological loop component of working memory, a system specialized for the temporary maintenance of incoming verbal information. It has therefore been proposed, that the construction of a stable representation of the phonological structure of the sounds of new words, depends on the adequacy of the temporary representations of the items in the phonological loop (Baddeley et al., 1996; Gathercole and Baddeley, 1996). Thus, children with good skills at maintaining new words in the phonological loop are able to establish accurate long term representations of the words more readily than children with poor phonological loop capacity.

However, Experiment 1 also demonstrated that the phonological memory does not predict understanding of a words' meaning as measured by the multiple choice task. Thus, the locus of the phonological memory involvement in acquiring a new vocabulary item seem likely to be in the process of achieving a stable phonological representation of its name than in the understanding of the word's meaning. Nevertheless, the testing took place immediately after the children were introduced to the items. Therefore another possible interpretation would have to do with children's ability to recall and retrieve in a quite short period.

8.3.1.3 Existing vocabulary/Prior lexical knowledge is related to the acquisition of the novel words from context

The effect of vocabulary size on word learning is what Stanovich (1986) has called a "Matthew effect", where the rich get richer, while the poor get poorer. He explained it as a reciprocal relationship; development of vocabulary facilitates comprehension, and comprehension feeds into vocabulary growth. The current knowledge base is of great importance in acquiring new information. A rich elaborated knowledge of words will assist the inference of meanings of unfamiliar words, allowing effective use of context cues. These cues boost incidental learning, thus expanding the child's knowledge base.

Experiment 1 demonstrated that children with high existing vocabulary knowledge (BPVS score) tended to perform better in the naming, inference and lexical contrast task than children with low existing vocabulary knowledge. However, vocabulary knowledge was not related with performance in the analogy, definition, sentence generation, and multiple choice task. The relation of the existing vocabulary knowledge with word learning has also been demonstrated by other studies. For example, Gathercole et al., (1997) found that children's existing vocabulary knowledge (BPVS score) played a significant role in the long-term learning of the sounds of new words.

Moreover, Robbins and Ehri (1994) found that children with larger vocabularies (PPVT-R score) learnt more new words than those with smaller vocabularies as measured by a multiple choice test. That finding contradicts with the findings of Experiment 1 which showed no relation between children's existing vocabulary knowledge and their performance on the multiple choice task. A range of possible explanations for that discrepancy can be proposed. It may be due to the different test of existing vocabulary knowledge used. Robbins and Ehri used the PPVT-R vocabulary test, while the BPVS test was used in Experiment 1. Vocabulary seems to be a fragile factor depending on how the lexicon is studied.

Nevertheless, since no significant relations were found in Experiment 1, Experiment 2 aimed to constrain the factor "vocabulary knowledge" by measuring children's prior lexical knowledge of other items from the same semantic domain as the novel words. Thus, Experiment 2 demonstrated that the children with high prior lexical knowledge (receptive and expressive vocabulary) performed better across tasks than children with low prior lexical knowledge. However, although significant correlations were found between children's expressive prior lexical knowledge and performance across tasks, the correlations between children's receptive prior lexical knowledge and performance across tasks tended towards significance.

The above finding implies that children's expressive prior lexical knowledge is more crucial for acquiring the full meaning of a word than the receptive prior knowledge. Possibly, expressive prior lexical knowledge reflects more advance levels of word knowledge (see triangles at section 7.4.3.6) which can foster word learning than the receptive one.

Furthermore, the children's prior lexical knowledge (expressive and receptive) for animals was related to the acquisition of the target words describing animals across tasks and testing. On the other hand, children's prior lexical knowledge (expressive and receptive) for artifacts was not related to the acquisition of the target words describing artifacts again across tasks and testing.

Those findings support other experimental work. For example, Carey and Bartlett (1978) found that the children's partial mappings of the novel word, were highly dependent on the child's preexisting colour lexicon. Nevertheless, the fact that the pattern was not consistent across domains (e.g., animals and artifacts) is in accordance with other studies. For example, Heibeck and Markman (1987) in a study of word learning found significant correlations between children's prior lexical knowledge in the domain of colour and texture and children's ability to learn new words from those domains. On the other hand, no correlation was found for children learning shape words and their prior knowledge in the domain of shapes.

A possible interpretation for the above relation between prior lexical knowledge of a domain and learning novel words from that domain may be that prior familiarity with words in a particular lexical domain may influence fast mapping ability to some degree. Children in the present experiment knew most of the animal words included in the vocabulary assessments but knew many fewer artifact words. Children who were introduced to new animal terms learned more about words from that domain than about the artifacts domain. It may be that once children have established a domain, the assumptions of mutual exclusivity and contrast may be operating more effectively to help the children to analyse the object, eliminate hypotheses and discover what property the new label refers to. It is also possible that the domain of artifacts may not yet be structured into a domain and therefore any linguistic information may be less useful if the child does not consider the information given (contrasts, definition) within the domain.

Another explanation for the differences found across domains may be that children are more likely to correctly associate a new word with its referent if the domain is salient to the child. If artifacts are simply not as salient for children as animals this could account for children's poorer performance in both the vocabulary assessment and in learning the new artifact words presented.

8.3.1.4 Prior knowledge of the lexical items is related to novel word learning

When children meet novel words these may be totally unknown or partially represented in their mental lexicon. Experiment 2 demonstrated that children performed better if the words were partially represented than unknown in those tasks that were deemed more difficult for the children to perform such as the naming, definition, and short questions task. In contrast, children's performance on the multiple choice, association, contrast and story generation tasks was not found to be related with children's prior knowledge of the lexical items. It seems likely then, following the triangles, presented at the end of Experiment 2, that these initial partial representations provide the children with a sufficient knowledge to further elaborate the representation and move up the triangle.

Also, children's success on the above tasks could also be related with the three aspects of the word's meaning-reference, sense, denotation- (Lyons, 1977). Thus, the findings demonstrate that if the children have already acquired the denotation or part of the denotation of the word's meaning (success in the multiple choice task for the partially represented words) they can then easier extend the acquisition of the word's denotation (success in the naming task) and acquire the sense of the word's meaning (success in the definition and categorisation questions tasks).

The effect of prior knowledge of the lexical items have also been identified by previous studies. Thus, Carey and Bartlett (1978) found that children's partial mappings of the novel word amongst other factors were highly dependent on the name the children used for the target words during pre-tests. Furthermore, Gelman et al., (1998) found that children were much more likely to overextend in comprehension when they did not know the name of the item than when they did.

Furthermore, the Qualitative analysis of the association task demonstrated that the children provided more thematic justifications for the partially represented than the unknown words. A possible interpretation could be related to script theory (Schank & Abelson 1977; Nelson, 1985). According to the theory, young children's knowledge is more likely to be represented in terms of relations, routines and dynamic structures.

It was also found that the children provided more functional properties for the partially represented than the unknown words during the story generation task. A possible explanation for that pattern could be related to the Functional core theory (Nelson, 1974). According to this theory children's development of a new concept begins with the first experience of a new object. That provides a set of relations which an object has with other entities. Once a list of functions has been identified, the other objects which possess the same characteristics are categorised as belonging to the same concept.

From the above, it can be concluded that when children have already established a partial representation of a word's meaning, that representation mainly concerns thematic and functional properties. A possible explanation could be that children acquire the words' meanings in context and not in isolation. Therefore, they relate them with the other items found together in the same context.

8.3.2 Nature of the lexicon

For the purposes of the present study, the nature of the lexicon was defined as the semantic domain to which the target words belong. The semantic domain was found to play a significant role in lexical acquisition. The role of the nature of the lexicon for lexical acquisition is discussed in the following subsection.

8.3.2.1 The word learning process differs by the semantic domain of the target words

Experiment 2 demonstrated that children's performance on the word learning tasks varied as a function of the semantic domain that the target words belong to. Particularly, the Qualitative analysis of the Association, Definition and Story generation task indicated that children's focus on a variety of properties differ by the semantic domain of the target words. Thus, when children acquire words describing animals they mainly focus on perceptual/descriptive, functional and contextual properties, while they focus on semantic properties when they acquire target words describing artifacts.

The above finding could probably imply that the domains of animals and artifacts are different semantic domains with the artifacts domain having sharp clear-cut boundaries-since the children focus on their semantic properties-while the animal domain has less clear cut boundaries -since they focus on perceptual/descriptive and contextual properties-for the particular age group of children. It is also probable, that the children were more familiar with the use of the particular artifacts in their everyday life than with animals and thus, had mapped them to the relevant semantic domain.

The above line of interpretation is also supported by relevant research to other domains. Braisby and Dockrell (1999) found that young children are sensitive to the semantic distinction between natural kind and colour terms and that the difference can be explained on semantic grounds. For example, natural kind and colour terms differ semantically, with natural kind terms having sharp, clear boundaries and colour terms having unclear or variable boundaries.

The findings can have important implications about the development of a theory of word learning from context which could take into account the semantic domain the target words belong to.

8.3.3 Nature of the input

Another focus of the present study was to what extent the nature of the input influences word learning from context. It was found that children used the linguistic input to infer the meanings of novel words. Those findings are discussed to a greater extent in the following subsections.

8.3.3.1 Children can use the linguistic input to infer the meanings of the novel words

The present study demonstrated that children can learn novel words from listening to stories. The results obtained support and extend previous studies (Leung and Pikulski, 1990; Eller et al. 1998; Elley, 1989; Robbins and Ehri, 1994; Senechal and Cornell, 1993) in various ways. Both experiments indicated that children performed better in those tasks where input and assessment matched. For example, during Experiment 1 the children in the Inference condition (input) performed better on the inference task (assessment) than the children in the other conditions. The same pattern was also found for the children in the Analogy, Definition and Lexical contrast conditions and their performance on the corresponding tasks. In a similar way, Experiment 2 demonstrated that the children in the Lexical contrast group performed better on the contrast task than the children in the other groups, as well as that the children in the Definition group were more able to provide a definition for the novel words than their counterparts in the other groups.

The above findings imply that children used the linguistic context and the information given as a basis to infer the meanings of the novel words as measured by the corresponding tasks. Children's success on the particular tasks (analogy, contrast, definition) was mainly dependent on the input received from the external environment -contextual cues and mediating variables according to Sternberg and Powell's theory-. That was shown by the failure of the other groups to succeed on the particular tasks.

In addition, another finding which supports the above position, is that in Experiment 2 the children in the Lexical contrast group performed better on the association task, "world knowledge questions", definition and story generation tasks than the other groups. The Lexical contrast context provided them with information about the relations of the target item with others from the same semantic category as well as information about where the item can be found. That argument is in accordance with Elbers et. al. (1993) who claim that the usefulness of contrast is in relation to other similar words rather than to the whole lexicon. They also suggest that such contrast will aid children's understanding of the relationships between words. Consequently, the children used the information and outperformed the other groups who had not received the appropriate input.

Additionally, children's ability to use the linguistic input to infer the meanings of the novel words was shown in their performance on the association task. When the children were asked to put items together without receiving any prior semantic input (e.g., Phonological control group) their justifications were based on thematic properties. On the other hand, when they were given semantic input about the target words (e.g., Definition and Lexical contrast group) their justifications were based on semantic properties. It is probable that the Phonological group children provided thematic justifications for the partially represented target items, since they were based on their past experiences with the items (acquired in context, in relation with other items) and not on any prior linguistic input. On the other hand, the Definition group provided semantic justifications because they received semantic input, and therefore, they did not have to rely on past experiences.

Overall, the use of the linguistic context to infer the meanings of unknown words has also been documented by other studies (Carey and Bartlett, 1978; Dockrell and Campbell, 1986; Gottfried and Tonks; 1996). Both, Carey and Bartlett (1978) and Dockrell and Campbell (1986) demonstrated that children used the semantic linguistic contrast to infer the meaning of novel colour terms. Furthermore, Gottfried and Tonks (1996) found that children can use an inclusion statement to infer the meaning of a colour word. However, none of the previous studies has contrasted different factors for word learning using multiple measurements.

8.3.3.2 Different linguistic contexts contribute to the acquisition of different aspects of word meaning

Once the children extract individual words from speech, they have to learn their meanings. In order to acquire the meaning of a word the children must learn the accurate phonological representation of the lexical items, the syntactic properties of the word, the semantic representation as well as how the word is used to communicate one's intended message. Both experiments demonstrated that different linguistic contexts contribute to the acquisition of different aspects of word meaning.

8.3.3.2.1 Production

During Experiment 1 children in the Inference condition tended to perform better on producing the word than children in the other conditions during the immediate post test. On the other hand, during the delayed post test, children in the Lexical contrast condition performed better on producing the words than the children in the other conditions. A similar finding was demonstrated in Experiment 2, where the children in the Lexical contrast group performed better on producing the words than the children in the other groups.

The last finding indicates that children's exposure to a lexical contrast context about the novel words contributes to the acquisition of the phonological properties of the new words. The Lexical contrast task is characterised by what has been called by Clark "clearness of referent". Therefore, a possible interpretation of the above finding may be that in contexts where the referent for the new word is obvious (such as lexical contrast context) children are easily able to connect the referent and the new word and therefore respond successfully to production tasks. This interpretation is also supported by empirical research (Dockrell and Campbell, 1986; Heibeck and Markman, 1987). Dockrell and Campbell (1986) found that children used the Lexical contrast to recognize and comprehend novel words for animals. Furthermore, Heibeck and Markman, (1987) found that 2-3-and 4- year old children used the linguistic context to succeed in a Naming task.

8.3.3.2.2 Understanding of the words' meaning

In Experiment 1 children in the Inference condition performed better on the sentence generation task, than children in the other conditions for both post tests. The inference context provided children with information about the target words implicitly by constructing the meaning of the novel word in relation to others. It can be argued that the children used these information to build links with other items. Therefore, the provision of constructed information about the novel words' meaning may have contributed to their better performance on the sentence generation task. Schank (1975) has argued that the making of inferences is crucial in deriving meaning, serving to fill in missing slots, in order to move to a higher level organisation.

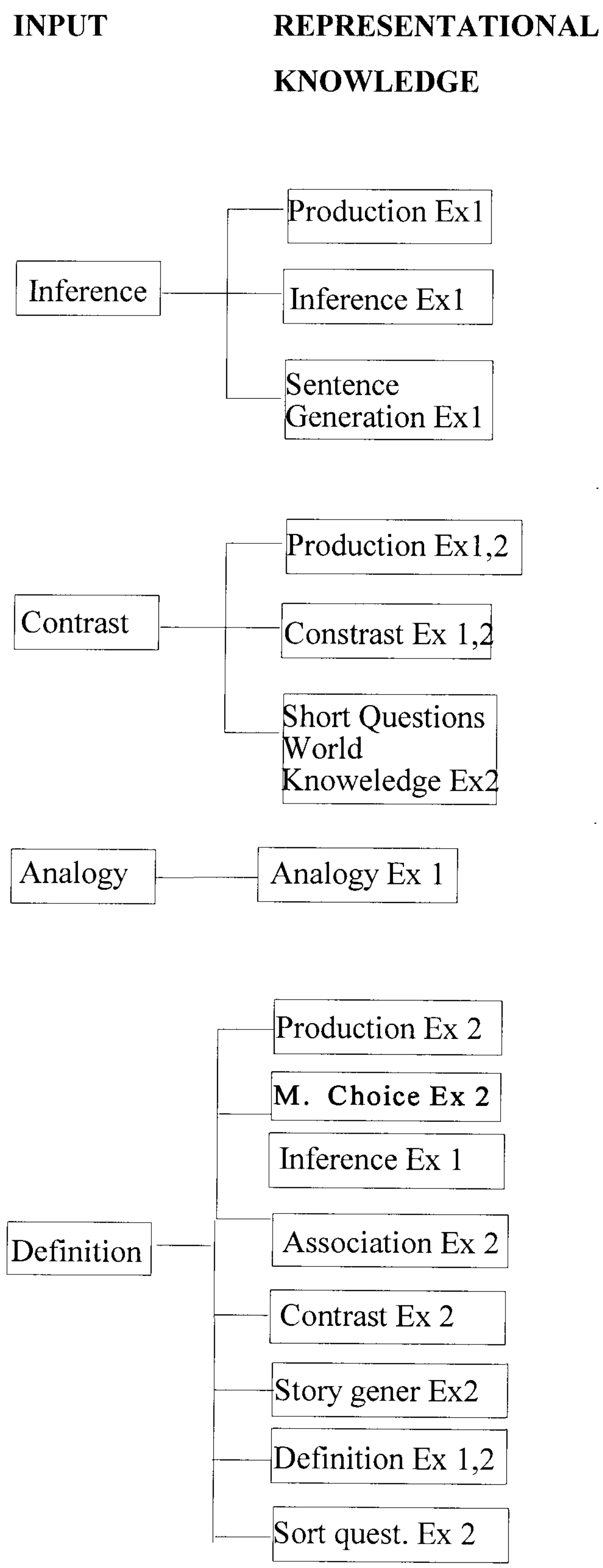
Furthermore, children in the Inference condition performed better on the inference task than children in the other conditions. Similarly, children in the Analogy condition performed better on the analogy task than children in the other conditions, while children in the Lexical contrast condition performed better on the contrast task than children in the other conditions for both post tests. Last, children in the Definition condition tended to provide more definitions than children in the other conditions during the immediate post test. The children used the context to infer the meaning of the novel words (see discussion in the previous section).

During Experiment 2, also the children in the Definition group performed better across tasks than the other groups across testing. A possible interpretation for the above finding is that the introduction of the novel words to explicit linguistic contexts such as the Definition condition, contributes more to word learning in general, than the introduction of the novel words to implicit linguistic contexts such as the Ostensive definition group. That interpretation is also supported by Gottfried and Tonks (1996) in their investigation of novel colour terms. They found that explicit information regarding the relation between novel and known colours is necessary for the acquisition of the novel terms.

The above discussion indicates that different linguistic contexts contribute to the acquisition of different aspects of word meaning. That finding can have important educational implications that will be discussed in subsequent sections. Diagram 8.1 demonstrates graphically how the different linguistic contexts contributed to the different aspects of word learning. With a first look, it can be seen that the children from the Analogy condition performed better on the Analogy task than all the other groups. Also, the Inference condition contributed to children's good performance in the production, inference and sentence generation task during the Experiment 1. The contrast condition as well contributed to children's good performance in the production, contrast and world knowledge questions. Last, by far, the Definition group outstriped all the other groups across tasks, therefore it seems to be the best predictor for word learning.

However, this does not necessarily mean that this is the best predictor for word learning, for example, all the types of word across all the age groups. In the present study, quite simple words were used. Maybe more difficulties would have arisen with more complex words, that their meaning could change from context to context.

Diagram 8.1: The contribution of different linguistic contexts to word learning



8.4 Issues in measuring word knowledge

Measurement of word learning with various tasks was also a main focus of the present study. In the following subsections, issues on measuring word knowledge, the discrepancies between comprehension and production, the phenomenon of overextension as well as the extent to which children's word knowledge change over time are discussed.

8.4.1 Children's word learning performance varies by the type of measurement

Both experiments demonstrated that children's performance varied by the way of measuring lexical knowledge. Experiment 1 demonstrated that during the immediate post test children performed better on the multiple choice and inference tasks than the other tasks. Children also performed better on the naming, definition and sentence generation tasks than the analogy and contrast tasks. The same pattern was found during the delayed post test.

Experiment 2 demonstrated that the multiple choice task was the one that children mostly succeed at, in comparison to the other tasks across testing. Then, they also performed better on the association than the other tasks across testing, as well as better on the definition than the other tasks across testing. Success on the world knowledge questions and naming task followed. Furthermore, children were least successful on the contrast, categorisation questions and story generation tasks across testing.

Possible explanations could be offered for children's low performance on the contrast, definition and story generation tasks. It is probable that the nature of the tasks themselves was hard, because they address explicit knowledge as in the case of the definition task. They may also tap on their wider understanding of the term. An example of such a task is the analogy and contrast task, which required the children to relate the target word with items from the same semantic category. They may also have needed more time in order to establish a semantic representation of the new term and its relation to other items from the same semantic category. Generating also a story using the new word is a quite demanding task requiring the children to demonstrate understanding of the words's meaning by providing appropriate relations with other items and to produce the novel word. This may tap on children's intelligence as well, however this was not measured by the present study.

The different performance across measurements has also been highlighted by other studies. Curtis (1987) demonstrated that different pictures of word knowledge emerge from different criteria by testing fifth graders on a set of words using several different measures. She found that they performed better on a checklist (students were to respond "yes" if they knew a word) than when asked to explain the meaning of the words and were worse when they were asked to give an example of the word. A very small number of students succeeded on the synonyms and complete explanations tasks. Moreover, Heibeck and Markman (1987) found that children's performance on a word learning task varied as a way of measurement, with the best performance shown on the comprehension task and the worst on the production task.

Children's performance on each task demonstrated a different aspect of their understanding of the target words. Success on the multiple choice task is probably the first element in the lexical acquisition, and the one mostly tapped by the lexical acquisition studies. The child is only required to recognize the item in a forced choice task. However, this does not show anything about the overall understanding of the word's meaning, and it would be very superficial and dangerous to draw inferences about word learning based only on a multiple choice task.

Concluding this subsection, it could be argued that the above findings demonstrate that comprehension and production is not an all-or-nothing ability. There may be different levels of comprehension and production. For example, if we take the case of comprehension, success on the multiple choice task could be the first level of comprehension. Then success on the rest of the understanding tasks could be mapped with more advanced levels. The above suggestion is in accordance with Donaldson and Laing (1993) who have distinguished three levels of comprehension (Level 0: non-linguistic comprehension; Level 1: partial linguistic comprehension; Level 2: full-linguistic comprehension).

Furthermore, the above suggestion is also in accordance with Oviatt (1980,1982) who distinguished two distinct types of comprehension, the "recognitory comprehension" and the "symbolic comprehension". The "recognitory comprehension" which is referred to as an early type of comprehension is defined as perceptual recognition of a linguistic form, association of that form with some regularity in the environment, and awareness of the match between the linguistic form and the intendent referent. The recognitory comprehension could be mapped with children's ceiling performance on the multiple choice task. On the other hand, the "symbolic comprehension" is more advanced and requires the child to show some evidence of understanding that a word does not merely co-occur with an object, but in fact stands for or refers to it. The "symbolic comprehension" could be also parallelled with children's success in the definition task for example.

8.4.2 Comprehension does not equal production

"Language comprehension" relates to the receptive function of language, that is, to the ability to make sense of language as a hearer or a reader. On the other hand, "Language production" refers to the expressive function of language, that is to the ability to use language as a speaker (Donaldson and Laing,1993).

How distinct are comprehension and production ? Both experiments in the present study demonstrated that children performed better on the multiple choice than the naming task. This discrepancy between production and comprehension has also been highlighted by other studies (Gathercole and Baddeley, 1989; Michas and Henry, 1994). According to Clark and Hecht (1983) comprehension and production are not symmetrical and that their differences show up in the earliest stages of language acquisition. Clark (1993) also claims that comprehension must precede production. Different studies have shown that young children can understand forms well before they can produce them (Clark and Berman, 1984; Harris, et. al 1993).

The apparent primacy of comprehension over production raises questions as to whether the cognitive requirements for comprehension are somehow more minimal than those for production. Oviatt (1980, 1982) has suggested that recognitory comprehension, for example involves more minimal cognitive demands than word production. One main difference is that comprehension is possible with only recognition memory (hearing a word and recognizing it), whereas production requires recall memory as well (having to retrieve the appropriate word from memory; Huttenlocher, 1974)

However, does better performance on comprehension versus production provide evidence for the two being separate processes ? Do we need to investigate other relations as well ? Experiment 1 demonstrated that children's performance on the multiple choice task was correlated with their performance on the naming task across testing. Furthermore, it was found that children's existing receptive vocabulary knowledge was correlated with performance on the multiple choice task across testing but not with performance on the naming task. Moreover, significant correlations were found between children's performance on the naming, analogy and contrast tasks during the Immediate post test. Nevertheless, correlation does not mean causation. It would be very interesting to investigate, in a future research, which predictors predict performance in which tasks using a regression analysis, something that was not applicable in the present research because of the nature of the data.

The same pattern was found in Experiment 2. Particularly, it was demonstrated that comprehension and production were correlated significantly with one another. It was also shown that the prior lexical knowledge (receptive and expressive) correlated with performance on the multiple choice and naming task across testing. Furthermore, during post test 1, performance on the naming task was correlated with performance on the "world knowledge questions" task; during post test 2, performance on the naming task was correlated with performance on the contrast, definition, categorisation questions and story generation tasks. Lastly, during post test 3, children's performance on the naming task was significantly correlated with their performance on all the other tasks.

The above patterns indicate that it is not that easy to claim with certainty that comprehension and production are two different processes, for two reasons. First, significant relations between performance on the comprehension and production tasks were found. Secondly, significant correlations between children's existing vocabulary knowledge and performance on the multiple choice and naming task were also identified. The last finding could probably imply that comprehension and production may not require such different prerequisites.

A final suggestion could be that comprehension and production may be distinct to a certain level (performance level) and interrelated at the same time. This suggestion could be related with Donaldson and Laing's (1993) claim who suggest that "a better understanding of language development entails establishing how production and comprehension inter-relate" (p.177).

8.4.3 Children overextend both in comprehension and production tasks

The present study demonstrated that overextensions occurred both in production (e.g, naming task) and comprehension tasks (e.g., definition task). Existence of overextension errors were also found by Gelman et al., (1998) in a multiple choice task. The overextensions that occurred in the present study both in naming and comprehension tasks could be explained in two possible ways. First, one possibility may be that overextensions in the naming task are in part usage errors and they may reflect a retrieval problem (Huttenlocher, 1974; Thompson and Chapman, 1977). Another possibility may be that overextensions reflect aspects of the child's underlying semantic representations. For example, if a child calls an ostrich duck, then the child assumes duck refers to ostrich as well as to duck. Unlike adults, who have constructed two separate lexical entries, the child has a single lexical entry. On this view, overextensions indicate a truly broader semantic category (Mervis, 1987).

Maybe the children who are in the process of developing a semantic representation about the new word make these overextension errors. These errors will disappear later on when they will have developed a correct semantic representation. That pattern was evident from the analysis of the naming tasks in both Experiments. Thus, in Experiment 1, during the delayed post test, and in post tests 2 and 3, they used less basic level words than in the immediate post test and post test 1.

8.4.4 Children's word knowledge of the target words changes over time

Both experiments demonstrated the extent to which children's word knowledge changed over time. Particularly, Experiment 1, showed that children's performance on the naming, multiple choice, analogy and contrast tasks was better during the immediate than the delayed post test. However, when the analysis was repeated for each group separately, it was found that the Analogy group performed significantly better on the analogy task during the delayed than the immediate post test. That finding demonstrates how the influence of the linguistic input can change the pattern. Moreover, the Inference group's performance on the inference, and sentence generation tasks was better during the delayed than the immediate post test. Experiment 2, also demonstrated that children's performance across most of the tasks differed significantly over time. Children's performance on the naming, definition, short questions and story generation tasks improved over time. No significant differences, over time were found for the multiple choice, association and contrast task.

Furthermore, qualitative analysis of the association task, demonstrated that children provided more semantic and perceptual justifications over time, while in the story generation task, they provided more functional and semantic properties over time. It is probable that children's exposure to informative linguistic contexts guided their attention to the semantic and perceptual properties of the words' meanings. Lastly, in the naming task the children made fewer overextension errors over time.

The obtained results from Experiment 1 demonstrated how limited our understanding for lexical acquisition can be, if we base our inferences only on one assessment. Additionally, Experiment 2 demonstrated that children's representations (both of the phonological and semantic properties) of the novel words change over time moving towards the establishment of a correct representation of the word's meaning.

Change of lexical representations over time has been supported by the Representational redescription model by Karmiloff-Smith (1995). According to the model implicit information becomes explicit knowledge to the mind through representational redescription. However, the model cannot account for the group differences in the analogy task for example during Experiment 1 (see in following section) since it does not take into account the environment.

8.5 Towards a model explaining Lexical acquisition from context

Taking together the results from both experiments it can be concluded that a model of lexical acquisition is required that takes into account different factors and draws on different theoretical positions. The factors identified from the present research are: (a) child based factors (age, existing vocabulary/prior lexical knowledge, phonological memory and prior knowledge of the lexical items); (b) the nature of the lexicon (semantic domain of the novel words) and (c) the nature of the input (linguistic context).

It is proposed that a model of lexical acquisition could draw on explanations proposed by three different theoretical positions such as the Interactive functional model and the theory of lexical acquisition in discourse context proposed by Nelson (1990) in relation to theories of learning from context (Sternberg and Powell, 1983).

Children's performance was found to be influenced by the nature of input and the nature of the lexicon as well as by other child based factors. The influence of the external environment has been supported by Nelson's interactive functional model which considers the environment as one of the crucial factors for lexical acquisition. According to the model, children learn new words by interacting with adults linguistically and non-linguistically in a variety of contexts. In those cases, the adult is a collaborator who supports inferences and provides feedback.

Furthermore, the influence of the nature of the input is also consistent with Nelson's (1993) recent theoretical claim that a theory of lexical acquisition in discourse context is required to explain word learning at all levels and for all word types. According to that theory, words acquire meaning in discourse contexts.

This claim is also supported by research showing that pragmatic and grammatical contexts enable a child to grasp the word's use and eventually it's meaning (Nelson's Hampson's and Shaw's, 1993; Nelson, 1988). Nelson's claim is also supported by other studies showing the important role of input for word learning. Evidence comes both from fast mapping studies (Gottfried and Tonks, 1996; Au, 1990) and more naturalistic studies such as from listening to stories (Robbins and Ehri, 1994; Senechal and Cornell, 1993; Leung and Pikulski, 1990; Eller et al., 1988). The important role of the linguistic context is also supported by the Sternberg's and Powell's (1983) theory of word learning from context. According to the theory, contextual cues and mediating variables in the linguistic context influence the likelihood that the meanings will be correctly inferred.

Additional, to these theories, other child based factors were identified as playing an important role in lexical acquisition such as age, phonological memory and existing/prior vocabulary knowledge. The above finding is also consistent with other studies (Michas and Henry, 1994; Robbins and Ehri,1994; Gathercole and Baddeley, 1990). The finding that children's performance did vary by above developmental factors probably implies fundamental changes occurring across the entire cognitive system. For example, older children have greater knowledge and better processing capacities.

8.6 Implications for lexical acquisition

The present study has theoretical, educational and methodological implications. Theoretically, the study indicates that a new account for a model of lexical acquisition should be developed. The new model should draw on different theoretical accounts which complement each other in order to shed some light on the lexical acquisition process. Thus, the Nelson's Interactive functional theory and Sternberg's and Powell's theory of word learning from context in relation to Karmiloff-Smith's proposals about the implicit and explicit representations as well as child's cognitive factors should be taken into account in order to better understand word learning from context.

Regarding the educational implications, the obtained findings may be pertinent for intervention programmes designed to foster language development from listening to story-books which present novel words in explicit linguistic contexts. Specifically, parents and preschool teachers should realize that young children need more than one exposure to a storybook in order to learn novel words. Moreover, asking simple questions such as those used as lexical tasks in the present study, may foster word learning, by showing the adult what the child already knows and what s/he needs to learn more. This is very well related to the Vygotskian view about development in general. The educator knowing where the child is (e.g. in the triangle) can provide the appropriate scaffolding to help him/her move up.

Methodologically, a series of lexical tasks which assess word learning in different ways was carefully designed and developed. Moreover, the present study suggested that those different measures could be employed by researchers when they measure word learning in order to unfold the multifaceted nature of word learning.

8.7 Limitations of the study and suggestions for further research

The obtained results may be limited in five ways. First, the lexical acquisition process was investigated only through the acquisition of nouns and particularly names for objects. The results may be extended to abstract words or to other grammatical categories such as verbs, adjectives or different attribute terms, properties and relations. Secondly, the acquisition of words for known concepts was investigated in the present study. It would be very interesting to look at the lexical acquisition process for words where the concept is unknown to the children. Is it still the same pattern ? Thirdly, certain types of contexts were explored and stories can be one of the many ways that children can learn new words from. The results could be extended by including other types of contextual cues and different modes of presentations, such as listening to versus reading a story, or watching a video.

Fourthly, this study was carried out in the English language, and it is unknown whether the results could be generalised in other languages. A possibility for extension would be to replicate the study in different languages with different structures. Fifth, this study did not address social factors. It would be interesting to investigate to what extent social factors such as the socioeconomic status (SES) of the family, the educational background of the parents, children's exposure to books relate to word learning. Bornstein et. al. (1998) for example have examined the role that the sociodemographic characteristics play in children's (aged 1;8) vocabulary competence. Lastly, the replication of the present study to different populations such as children with language difficulties, or blind children would shed light on to what extent the present findings are applicable both to normal and children with language difficulties.

8.8 Concluding remarks

The present study demonstrated that children's lexical acquisition process from context varies very much by the nature of the linguistic input to which the children are exposed, the nature of the lexicon such as the semantic domain of the target words, children's prior lexical knowledge of the target words and existing vocabulary, as well as their age and the task that is used to measure word learning. The study has both theoretical, educational and methodological implications. The importance of how we measure word learning and the conclusions we draw was also demonstrated.

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Appendix 4.1
Stories used in the Pilot study

Inference condition

Story about the tangophon (saxophone)

Bob liked blowing balloons, bubbles or candles whenever he had the chance. So, his mother decided to buy him a **"tangophon"**. The same afternoon, Bob went to a private teacher to teach him how to play music with that nice **"tangophon"**. He thought it would be nice to be member of the band of his school. Unfortunately, the next day he got a cold and a cough; he was feeling weak and he couldn't even move his fingers. So, he couldn't press or keep anything metal in his hands. This made him to cancel the music lesson. He stayed at home, laying in bed and dreaming a music lesson. However, after some days he returned to his music class and enjoyed the lesson.

Story about the tramacle (tricycle)

One sunny day, children decided to go out in the playground to play. They had so many things to do out there like riding a **"tramacle"**. However, John didn't want to go out because he was afraid of falling down. The teacher told him that he couldn't fall down if there were two wheels at the back. John, listened to his teacher. He went out and he rode a **"tramacle"**. He had a great fun because he was not afraid any more.

Story about the feber (teepee)

One day the children in the school decided to play Indians. The first thing they thought was to find a place to stay. They thought that they should make a **"feber"** but they didn't have animal skins. So they decided to use a type of cloth that looked like an animal skin. All of them got very excited with the idea. They spent the whole day making the **"feber"**. At the end of the day they had only just finished with it. But now it was time to go home. All the children were very proud of what they made. Now they had to wait for the next morning to come and play in the school with what they made.

Story about the sackets (sandals)

Last summer Lora and her family went on holiday to an island. They were staying at a house near the sea. Because of the warm weather they were wearing T-shirts, shorts, and **"sackets"**. Sometime, after a couple of days, Lora found that the tops of her feet had not got brown in the sun, like the rest of her body. The tops of her feet had white lines across them that looked like straps. Her mother told her that this was happening because she was wearing **"sackets"**. Lora still remembers her holidays in that island.

Definition condition

Story about the tangophon (saxophone)

Last Sunday, George and his daddy went to a concert. They enjoyed the music they listened to. However, George didn't know one of the musical instruments, the **"tangophon"** and asked his daddy to tell him about it. So his daddy told him that the **"tangophon"** is a musical instrument made of metal, that you play by blowing and pressing keys. George stayed the rest of the day listening to the music. He had a really nice time.

Story about the tramacle (tricycle)

One sunny morning, Bill with his daddy went for shopping. While they were walking across the streets, they saw a shop with different kinds of bicycles. They went in and the shopkeeper showed them different kinds of bicycles. Bill didn't know what the **"tramacle"** was, so he asked the shopkeeper to tell about it. The shopkeeper told him that the **"tramacle"** has two wheels at the back instead of one. Bill thanked the shopkeeper for the information she gave him and continued shopping with his daddy.

Story about the feber (teepee)

One rainy afternoon, the teacher brought to the children a book with nice pictures in it. It was a book about different kinds of houses (this sentence was left out in the main study). The children were looking at the book and in one of the pages they saw what the teacher called a **"feber"**. The children didn't know what this was and they asked the teacher to tell them about it. So the teacher said that the **"feber"** is a tent made by North American Indians from animal skin.

Story about the sackets (sandals)

One day John and his mother decided to go to the sea. His mother told him to wear his **"sackets"**. John didn't know which these were. His mother told him that the **"sackets"** were those light shoes, which are for wearing in warm weather. They have straps instead of a solid part over the top of the foot. John wore them and went to the sea. He had really nice time.

Analogy condition

Story about the tangophon (saxophone)

Robert and his mother went to a party last Saturday. There were children playing music (was left out in the main) and a child that was singing. The child with the orange shirt was playing a **"tangophon"**. Robert really liked the music that was coming from it. He asked his mother to tell him how you play it. His mother told him that we make sounds with the **"tangophon"** like we make sounds with the trumpet by pressing buttons and blowing. From that moment, Robert knew how someone could produce such a nice music, and he spent the whole night listening to that music.

Story about the tramacle (tricycle)

David and his mummy went to the country for the weekend. There they had the chance to meet other children and play together. One of the younger children had a **"tramacle"** that was riding on. David really liked it, so he told his mummy if he could buy one for him. His mother told him that this was not for her because he was quite old for it. She reminded him that this **"tramacle"** is for the young children like the bicycle is for older children like him. So, David understood that this wasn't for him, and he could ask something else from his mummy next time.

Story about the feber (teepee)

Kevin and his mother went to Disneyland during holidays. In one of the corners of the Disneyland there was a **"feber"**. There they saw that most of the children liked this, and so they spent much of their time there. Kevin didn't know what this was, so he asked his mummy to tell him about it. His mummy told him that the **"feber"** was for the Indians like the house is for them. Kevin then understood why all the children had spent most of their time there. It was something that they had never seen before.

Story about the sackets (sandals)

Last summer John and his family went to a very warm country for holidays. His mother told him that all the people there, were wearing **"sackets"**. John didn't understand what these were, so his mother told him that those people wear **"sackets"** like we wear boots. John really liked them and asked his mummy to buy a pair for him.

Lexical contrast condition

Story about the tangophon (saxophone)

In the school children had a group of musicians where each of them played different kind of musical instrument. Most of the children liked listening to the *piano* and to the *guitar*. But today a new child came in the group who was playing neither piano, nor a guitar. He was playing a **"tangophon"**.This was making sound in a different way. It was also, a kind of sound that they never heard before. So, all the children stop listening to the piano and to the guitar and they concentrated on the **"tangophon"**.

Story about the tramacle (tricycle)

One sunny day children went outside to play in the playground. They were having great fun, and they were very well-behaved" so the teacher decided to give them a surprise. She told them that she was going to bring something for them. Some minutes later she brought them a *car*, a *bicycle*, and a **"tramacle"**. The teacher told them that the young children were to ride only the **"tramacle"** not the *car* or the *bicycle*. So the young children followed what the teacher said and they had great fun for the whole day.

Story about the feber (teepee)

Yesterday Mary and her friends went to a party. There they played with many different things. They played with a *doll's house*, a *caravan* and a **"feber"**. They had great fun. However, after a while one mother came, saying that the children standing behind the **"feber"**, not the *doll's house*, or the *caravan* had to come out of the room. She said so, because there was not enough space for all of them. So the children did what the mother said, and they continued to have fun.

Story about the sackets (sandals)

One day Mary and her friends decided to go to the sea. Her mummy told her to wear her **"sackets"** not the boots or the ballet shoes. Mary listened to her mummy. She wore the **"sackets"** not the boots or the ballet shoes and went to the sea. They had a great time together.

Appendix 5.1

Target and Control vocabulary Multiple choice pre-test

Show me the x

Target	Correct	Wrong
Oboe		
Teepee		
Control	**Correct**	**Wrong**
Beret		
Hatchet		

Appendix 5.2

Stories used in the Experiment 1

Inference condition

"Something to blow"

Bob liked blowing whenever he had the chance; He was blowing up balloons, blowing bubbles or blowing out candles. So, his mother decided to buy him an "**abez**". The same afternoon, Bob went to private teacher to teach him how to play music with his new **"abez"**. He thought it would be nice to be member of his school's band. Unfortunately, the next day he got cold and cough; he was feeling weak and he couldn't even move his hands. So he missed his music lesson. He stayed at home, lying in bed and dreaming about magic music lesson. However, after some days he returned to his music class and enjoyed the lesson.

"Making a feber"

One day the children in the school decided to play the Indians. The first thing they wanted to do was to make place they could go in, sit in and play. They thought that they should make **"feber"**, but they didn't have animal skins. So, they decided to use type of cloth that looked like an animal skin. All of them got very excited with the idea. They spent the whole day making the **"feber"**. At the end of the day they had only just finished with it. But now, it was time to go home. All the children were very proud of what they made.

Definition condition

"What is an abez?"

Last Sunday, George and his daddy went to concert. They enjoyed the music they listened to. But George didn't know one of the musical instruments, the **"abez"**, and asked his daddy to tell him about it. So, his daddy told him that the **"abez"** is wooden orchestral instrument that is shaped like tube and played by blowing through reed at it's top. George stayed the rest of the day listening to the music. He had really nice time.

"What is a feber?"

One rainy afternoon, the teacher, brought to the children book with nice pictures in it. The children were looking at the book and on one of the pages they saw what the teacher called **"feber"**. The children didn't know what this was and they asked the teacher to tell them about it. So the teacher said that the **"feber"** is a tent made by North American Indians from animal skin. After that, the children were so excited that they asked the teacher whether they could make one like this.

Analogy condition

"Abez is like..."

Robert and his mother went to party last Saturday. There were children playing around and child that was singing. The child with the orange shirt was playing an **"abez"**. Robert really liked the music that was coming form it. He asked his mother to tell him more about it. His mother told him that we make sounds with the **"abez"** like we make sounds with the flute, by blowing. From that moment, Robert knew how someone could make such nice sound, and he spent the whole night listening to that music.

"What is a feber like?"

Kevin and his mother went to Disneyland during holidays. In one of the corners of the Disneyland there was **"feber"**. They saw that most of the children liked it, and so they spent much of their time there. Kevin didn't know what this was, so he asked his mummy to tell him about it. His mummy told him that the **"feber"** was for the Indians like the house is for them. Kevin then understood why all the children had spent most of their time there. It was something they had never seen before.

Lexical contrast condition

"Abez is different from..."

Every week in the school, the children had music lesson where each child played different kind of musical instrument. Most of the children liked listening to the piano and to the guitar. But today a new child came in the group who was playing neither a piano nor a *guitar*. He was playing an **"abez"**. This was making sound in a different way. It was also kind of sound that they never heard before. So, all the children stopped listening to the piano and to the guitar and they concentrated on the **"abez"**

"Feber is different from..."

Yesterday, Mary and her friends went to party. There, they played with many things. They were playing with the *doll's house*, with the *caravan* and with the **"feber"**. They had great fun. However, after while one mother came saying that the children standing behind the feber, not in the doll's house, or in the caravan, had to come out of the room. She said so, because there was not enough space for all of them. So, the children did what the mother said, and they continued to have fun.

Appendix 5.3

BPVS Scoring sheet

Date:

School:

Name:

Sex:

Age data:

	Year	Month	Day
Date of Testing	________	________	________
Date of birth	________	________	________
Chronological age:	________	________	________

Test scores of the Long Form of the BPVS (British Picture Vocabulary Scale)

Raw score: ________

Standardised score: ________

Equivalent score: ________

Percentile rank: ________

Age equivalent: ________

Appendix 5.4

Phonological memory test

Raw score:____________

CNRep: Scoring sheet

Practice items:

noop_

tam_

Main test items

No	Non-word	2 syl	3 syl	4 syl	5 syl	Comments
1	dopelate		*			
2	glistering		*			
3	pennel	*				
4	defermication				*	
5	contramponist			*		
6	hampent	*				
7	reutterpation				*	
8	perplisteronk			*		
9	blonterstaping			*		
10	sepretennial				*	
11	detratapillic				*	
12	glistow	*				
13	frescovent		*			
14	bannifer		*			
15	stopograttic			*		
16	woogalamic			*		
17	ballop	*				
18	confrantually				*	

No	Non-word	2 syl	3 syl	4 syl	5 syl	Comments
19	fenneriser			*		
20	altupatory				*	
21	pristoractional				*	
22	underbrantuand				*	
23	trumpetine		*			
24	sladding	*				
25	commetitate			*		
26	tafflest	*				
27	loddernapish			*		
28	barrazon		*			
29	commerine		*			
30	empliforvent			*		
31	thickery		*			
32	voltularity				*	
33	versatrationist				*	
34	rubid	*				
35	brasterer		*			
36	diller	*				
37	penneriful			*		
38	bannow	*				
39	prindle	*				
40	skiticult		*			
	TOTAL					

Raw score:

Appendix 5.5

Post test measurements of Experiment 1

Date:

School:

Name:

Age:

Sex:

Immediate post test:

Delayed post test:

Linguistic condition group:

Inference:

Definition:

Analogy:

Contrast:

Recording sheet for the target word "feber"

Tasks	Feber	Right	Wrong	Do with it	Taxonomic	Thematic	Comments
Naming	What is this?	*	*				
Inference	What do we do with this ?			*			
Analogy	Do you know something else like this?	*	*				
Lexical contrast	Do you know something else different from this one?	*	*				
Definition	What do you think a feber is ?	*	*				
Multiple choice	Show me the feber?	*	*				
Prompt	Which of these goes best with the feber?				*	*	
Sentence generation	Why do you think they go together ?	*					

Recording sheet for the target word "abez"

Tasks	**Abez**	**Right**	**Wrong**	**Do with it**	**Taxonomic**	**Thematic**	**Comments**
Naming	What is this?	*	*				
Inference	What do we do with this?			*			
Analogy	Do you know something else like this?	*	*				
Lexical contrast	Do you know something different from this one?	*	*				
Definition	What do you think an abez is?	*	*				
Multiple choice	Show me the abez?	*	*				
Prompt	Which of these goes best with the abez?				*	*	
Sentence generation	Why do you think they go together ?	*					

Appendix 5.6

Target and Control vocabulary Multiple choice pre-test plates

Multiple choice plate for the abez (Target word "oboe")

Target word abez	**Phonological foil** abacus
Semantic foil castanets	**Irrelevant foil** hurdle

Multiple choice plate for the feber (Target word "teepee")

Target word feber	**Phonological foil** festoon
Semantic foil thatch	**Irrelevant foil** ivy

Multiple choice plate for the beret (Control word)

Target word beret	**Phonological foil** beaver
Semantic foil hat	**Irrelevant foil** lectern

Multiple choice plate for the hatchet (Control word)

Target word hatchet	**Phonological foil** harpoon
Semantic foil trowel	**Irrelevant foil** sword

Appendix 5.7

Children's performance (means and sds) on the multiple choice task (for the target and control words) for both post tests

	Age	Pre-test	Immediate post test				Delayed post test			
			Inference	Analogy	Lex.contrast	Definition	Inference	Analogy	Lexical contrast	Definition
			Mean (sd)	Mean (sd)	Mean (sd)	Mean (sd)	Mean (sd)	Mean (sd)	Mean (sd)	Mean (sd)
Control	**3;6-4;6**	0	0 (.00)	0 (.00)	0 (.00)	0 (.00)	0 (.00)	0 (.00)	0 (.00)	0 (.00)
	4;6-5;6	0	0 (.00)	0 (.00)	0 (.00)	0 (.00)	0 (.00)	0 (.00)	0 (.00)	0 (.00)
	5;6-6;6	0	0 (.00)	0 (.00)	0 (.00)	0 (.00)	0 (.00)	0 (.00)	0 (.00)	0 (.00)
Target	**3;6-4;6**	0	1.8 (.54)	1.8 (.34)	1.9 (.25)	1.7 (.45)	1.6 (.62)	1.5 (.73)	1.7 (.58)	1.5 (.82)
	4;6-5;6	0	1.7 (.45)	2.0 (.00)	2.0 (.00)	2.0 (.00)	1.5 (.82)	1.2 (.86)	1.8 (.50)	1.8 (.50)
	5;6-6;6	0	1.8 (.34)	1.9 (.25)	2.0 (.00)	1.9 (.25)	1.8 (.54)	1.5 (.81)	1.8 (.50)	.5 (82)

Appendix 5.8

Correlations (bivariate and partial) between children's age and performance on the naming task for both post tests

	Naming (I)	Naming (D)
Age	.3742	.1144
	(192)	(192)
	p=.000	p=.057
Controlled for Vocabulary		
	.3755	.0953
	(189)	(189)
	p=.000	p=.095
Controlled for Memory		
	.3458	.0707
	(189)	(189)
	p=.000	p=.166

Abbreviations: I = Immediate post test; D= Delayed post test

Appendix 5.9

Children's performance across tasks by age and vocabulary level

		Immediate post test						Delayed post test					
		High phon.memory			Low phon.memory			High phon.memory			Low phon.memory		
		Mean	(sd)	Range	Mean	(sd)	Range	Mean	(sd)	Range	Mean	(sd)	Range
Naming	**3;6-4;6**	.65	(.54)	2.00	.70	(.70)	2.00	.38	(.55)	1.00	.33	(.61)	2.00
	4;6-5;6	1.06	(.85)	2.00	.67	(.65)	2.00	.45	(.72)	2.00	.42	(.66)	2.00
	5;6-6;6	1.33	(.79)	2.00	1.32	(.72)	2.00	.58	(.81)	2.00	.54	(.58)	2.00
M.choice	**3;6-4;6**	1.88	(.33)	1.00	1.67	(.56)	2.00	1.67	(.69)	2.00	1.50	(.72)	2.00
	4;6-5;6	1.97	(.18)	1.00	1.94	(.24)	1.00	1.58	(.76)	2.00	1.52	(.76)	2.00
	5;6-6;6	2.00	(.00)	.00	1.94	(.24)	1.00	1.79	(.64)	2.00	1.73	(.59)	2.00
Inference	**3;6-4;6**	1.65	(.53)	2.00	1.50	(.66)	2.00	1.70	(.52)	2.00	1.42	(.72)	2.00
	4;6-5;6	1.26	(.77)	2.00	1.18	(.82)	2.00	1.70	(.63)	2.00	1.52	(.53)	2.00
	5;6-6;6	1.60	(.62)	2.00	1.53	(.66)	2.00	1.60	(.67)	2.00	1.53	(.66)	2.00
Definition	**3;6-4;6**	1.13	(.74)	2.00	93	(.89)	2.00	1.15	(.86)	2.00	1.00	(.83)	2.00
	4;6-5;6	1.42	(.66)	2.00	1.10	(.75)	2.00	1.30	(.87)	2.00	1.10	(.75)	2.00
	5;6-6;6	1.00	(.91)	2.00	1.06	(.85)	2.00	1.27	(.73)	2.00	1.03	(.87)	2.00
Analogy	**3;6-4;6**	.15	(.43)	2.00	.29	(.62)	2.00	.22	(.53)	2.00	.13	(.34)	1.00
	4;6-5;6	.71	(.82)	2.00	.58	(.79)	2.00	.64	(.67)	2.00	.39	(.78)	2.00
	5;6-6;6	.96	(.86)	2.00	.57	(.94)	2.00	.60	(.77)	2.00	.59	(.82)	2.00
Contrast	**3;6-4;6**	.35	(.70)	2.00	.25	(.61)	2.00	.10	(.38)	2.00	.04	(.20)	1.00
	4;6-5;6	.52	(.85)	2.00	.24	(.61)	2.00	.26	(.63)	2.00	.06	(.35)	2.00
	5;6-6;6	.53	(.86)	2.00	.44	(.82)	2.00	.50	(.82)	2.00	.15	(.44)	2.00
Sentence g.	**3;6-4;6**	1.35	(.83)	2.00	1.04	(.86)	2.00	1.50	(.78)	2.00	1.04	(.86)	2.00
	4;6-5;6	.97	(.80)	2.00	1.18	(.85)	2.00	1.36	(.82)	2.00	1.19	(.91)	2.00
	5;6-6;6	1.30	(.84)	2.00	1.35	(.81)	2.00	1.47	(.78)	2.00	.32	(.84)	2.00

Appendix 5.10

Children's performance across tasks by age and phonological working memory level

		Immediate post test						Delayed post test					
		High phon.memory			Low phon.memory			High phon.memory			Low phon.memory		
		Mean	(sd)	Range	Mean	(sd)	Range	Mean	(sd)	Range	Mean	(sd)	Range
Naming	**3;6-4;6**	.81	(.69)	2.00	.58	(.55)	2.00	.27	(.45)	1.00	.42	(.64)	2.00
	4;6-5;6	.97	(.76)	2.00	.73	(.78)	2.00	.47	(.66)	2.00	.40	(.72)	2.00
	5;6-6;6	1.44	(.65)	2.00	1.18	(.86)	2.00	.67	(.72)	2.00	.43	(.69)	2.00
M.choice	**3;6-4;6**	1.88	(.33)	1.00	1.74	(.50)	2.00	1.54	(.81)	2.00	1.66	(.63)	2.00
	4;6-5;6	1.97	(.17)	1.00	1.93	(.25)	1.00	1.62	(.74)	2.00	1.47	(.78)	2.00
	5;6-6;6	1.97	(.17)	1.00	1.96	(.19)	1.00	1.83	(.51)	2.00	1.68	(.72)	2.00
Inference	**3;6-4;6**	1.69	(.47)	1.00	1.53	(.65)	2.00	1.62	(.57)	2.00	1.58	(.64)	2.00
	4;6-5;6	1.35	(.73)	2.00	1.40	(.67)	2.00	1.74	(.57)	2.00	1.47	(.57)	2.00
	5;6-6;6	1.53	(.61)	2.00	1.61	(.57)	2.00	1.50	(.70)	2.00	1.64	(.62)	2.00
Definition	**3;6-4;6**	1.08	(.84)	2.00	.95	(.84)	2.00	1.08	(.89)	2.00	1.11	(.83)	2.00
	4;6-5;6	1.29	(.76)	2.00	1.23	(.68)	2.00	1.32	(.77)	2.00	1.07	(.87)	2.00
	5;6-6;6	1.06	(.89)	2.00	1.00	(.86)	2.00	1.06	(.92)	2.00	1.25	(.84)	2.00
Analogy	**3;6-4;6**	.15	(37)	1.00	.24	(.59)	2.00	.27	(.60)	2.00	.13	(.34)	1.00
	4;6-5;6	.65	(.77)	2.00	.63	(.85)	2.00	.59	(.82)	2.00	.43	(.63)	2.00
	5;6-6;6	.61	(.90)	2.00	.64	(.91)	2.00	.61	(.84)	2.00	57	(.74)	2.00
Contrast	**3;6-4;6**	.35	(.69)	2.00	.29	(.65)	2.00	.12	(.43)	2.00	.05	(.23)	1.00
	4;6-5;6	.47	(.83)	2.00	.27	(.64)	2.00	.24	(.65)	2.00	.07	(.25)	1.00
	5;6-6;6	.50	(.88)	2.00	.46	(.79)	2.00	.36	(.72)	2.00	.25	(.59)	2.00
Sentence g.	**3;6-4;6**	1.23	(.86)	2.00	1.24	(.85)	2.00	1.35	(.89)	2.00	1.32	(.81)	2.00
	4;6-5;6	1.09	(.83)	2.00	1.07	(.83)	2.00	1.29	(.91)	2.00	1.27	(.83)	2.00
	5;6-6;6	1.28	(.85)	2.00	1.39	(.79)	2.00	1.33	(.86)	2.00	1.46	(.74)	2.00

Appendix 5.11

Children's responses in the naming task by age for both post tests

	4 year olds				5 year olds				6 year olds			
	Immediate		Delayed		Immediate		Delayed		Immediate		Delayed	
	N	%	N	%	N	%	N	%	N	%	N	%
Don't know	58	45.3	61	47.6	44	34.4	62	48.4	28	21.9	47	36.7
Phonological error	2	1.6	6	4.7	2	1.6	3	2.3	-	-	1	1
Irrelevant	3	2.3	10	7.8	3	2.3	8	6.3	-	-	5	3.9
Functional Properties	-	-	7	5.5	7	5.5	9	7	2	1.6	6	4.6
Basic level word	17	13.3	16	12.5	13	10.1	14	10.9	11	8.6	29	22.6
Supe/nate word	5	3.9	5	3.9	4	3.1	4	3.1	2	1.6	4	3.1
Accurate	43	33.6	23	17.9	55	43	28	21.9	85	66.4	36	28.1
N of responses		128		128		128		128		128		128

Appendix 5.12

Children's responses in the naming task by linguistic condition for both post tests

	Inference				Analogy				Lexical Contrast				Definition			
	Immediate		Delayed		Immediate		Delayed		Immediate		Delayed		Immediate		Delayed	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Dk	27	28.1	34	35.4	41	42.7	52	54.2	23	24	39	40.6	39	40.6	45	46.9
Pho	-	-	3	3.1	1	1	1	1	1	1	-	-	2	2.1	6	6.2
Irre	1	1	2	2	1	1	6	6.2	1	1	4	4.2	3	3.1	11	11.5
Fu	3	3.1	8	8.3	1	1	-	-	4	4.2	8	8.3	1	1	6	6.2
Ba	12	12.5	19	20	13	13.5	14	14.6	9	9.4	18	18.7	7	7.3	8	8.3
Su	3	3.1	5	5.2	-	-	-	-	6	6.2	6	6.2	2	2.1	2	2.1
Accu	50	52.1	25	26	39	40.7	23	24	52	54.1	21	21.9	42	43.7	18	18.8
N	96		96		96		96		96		96		96		96	

Abbreviations: Imme= Immediate; Delay: Delayed; Dk= Don't know; Pho= Phonological error; Irre= Irrelevant; Fu=Functional properties; Ba=Basic level word; Su=Superordinate level word; Accu=Accurate responses

Appendix 5.13

Correlations (bivariate and partial) between children's age and performance on the multiple choice task for both post tests

	Multiple choice (I)	Multiple choice (D)
Age	.2242	.1546
	(192)	(192)
	p=.001	p=.016
Controlled for Vocabulary		
	.2219	.1423
	(189)	(189)
	p=.001	p=.025
Controlled for Memory		
	.1941	.1242
	(189)	(189)
	p=.004	p=.043

Abbreviations: I=Immediate post test; D= Delayed post test

Appendix 5.14

Correlations (bivariate and partial) between children's age and performance on the inference task for both post tests

	Inference (I)	Inference (D)
Age	.1180	.1200
	(192)	(192)
	p=.048	p=.039
Controlled for Vocabulary		
	.1275	.1338
	(189)	(189)
	p=.039	p=.035
Controlled for Memory		
	.1280	.1242
	(189)	(189)
	p=.040	p=.043

Abbreviations: I=Immediate post test; D= Delayed post test

Appendix 5.15

Distribution of children's responses in the inference task by age for both post tests

	4 year olds				5 year olds				6 year olds			
	Immediate		Delayed		Immediate		Delayed		Immediate		Delayed	
	%	n	%	n	%	n	%	n	%	n	%	n
Dk	24.2	31	21.9	28	19.5	25	10.9	14	14.8	19	11.7	15
Irre	8.6	11	7.8	10	5.5	7	7	9	1	1	2.3	3
Act	44.5	57	45.3	58	46	59	42.2	54	39	50	37.5	48
Fu	22.6	29	25	32	28.9	37	39.8	51	45.3	58	48.4	62
N		128		128		128		128		128		128

Abbreviations: Dk=Don't know; Irre=Irrelevant; Act=Action on the object; Fu=Functional properties

Appendix 5.16

Distribution of children's responses in the inference task by linguistic condition for both post tests

	Inference				Analogy				Contrast				Definition			
	Immediate		Delayed		Immediate		Delayed		Immediate		Delayed		Immediate		Delayed	
	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
Dk	7.3	7	6.2	6	30.2	29	14.6	14	16.6	16	19.8	19	23.9	23	18.7	18
Irre	4.2	4	7.3	7	2	2	5.2	5	5.2	5	5.2	5	8.4	8	5.2	5
Act	62.5	60	47.9	46	35.4	34	36.4	35	38.5	37	43.7	42	36.4	35	38.5	37
Fu	26	25	38.5	37	32.3	31	43.7	42	39.6	38	31.2	30	31.2	30	37.5	36
N		96		96		96		96		96		96		96		96

Abbreviations: Dk=Don't know; Irre=Irrelevant; Act=Action on the object; Fu=Functional properties

Appendix 5.17

Correlations (bivariate and partial) between children's age and performance on the definition task for both post tests

	Definition (I)	Definition (D)
Age	.1200	.1223
	(192)	(192)
	p=.039	p=.039
Controlled for Vocabulary		
	.1275	.1338
	(189)	(189)
	p=.039	p=.035
Controlled for Memory		
	.1280	.1242
	(189)	(189)
	p=.040	p=.043

Abbreviations: I=Immediate post test; D= Delayed post test

Appendix 5.18

Distribution of children's responses in the definition task by age for both post tests

	4 year olds				5 year olds				6 year olds			
	Immediate		Delayed		Immediate		Delayed		Immediate		Delayed	
	%	n	%	n	%	n	%	n	%	n	%	n
Dk	58.5	75	60.1	77	42.2	54	28.9	37	17.1	22	20.3	26
Irr	8.6	11	7.8	10	7	9	10.2	13	1.6	2	0.8	1
Perc	3.1	4	0.8	1	3.1	4	0.8	1	0.8	1	3.1	4
Func	11.7	15	10.1	13	15.6	20	29.7	38	18	23	21.1	27
Sem	18	23	21.1	27	32	41	30.4	39	62.5	80	54.7	70
N		128		128		128		128		128		128

Abbreviations: Dk=Don't know; Irr=Irrelevant responses; Perc=Perceptual properties; Func=Functional properties; Sem=Semantic properties

Appendix 5.19

Distribution of children's responses in the definition task by linguistic condition for both post tests

	Inference				Analogy				Contrast				Definition			
	Immediate		Delayed		Immediate		Delayed		Immediate		Delayed		Immediate		Delayed	
	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
Dk	31.2	30	31.2	30	36.4	35	38.5	37	51	49	44.8	43	38.5	37	31.2	30
Irr	10.4	10	6.2	6	3.1	3	4.2	4	6.2	6	5.2	5	3.1	3	9.4	9
Perc	4.2	4	2.1	2	1	1	1	1	3.1	3	2.1	2	1	1	1	1
Func	15.6	15	28.1	27	19.8	19	23.9	23	12.5	12	18.7	18	12.5	12	10.4	10
Sem	38.5	37	32.3	31	39.6	38	32.3	31	27.1	26	29.2	28	44.8	43	47.6	46
N		96		96		96		96		96		96		96		96

Abbreviations: Dk=Don't know; Irr=Irrelevant responses; Perc=Perceptual properties; Func=Functional properties; Sem=Semantic properties

Appendix 5.20

Correlations (bivariate and partial) between children's age and performance on the analogy task for both post tests

	Analogy (I)	Analogy (D)
Age	.1691 (192) p=.010	.1819 (192) p=.006
Controlled for Vocabulary		
	.1276 (189) p=.039	.1331 (189) p=.033
Controlled for Memory		
	.1393 (189) p=.027	.1410 (189) p=.026

Abbreviations: I=Immediate post test; D= Delayed post test

Appendix 5.21

Distribution of children's responses in the analogy task by age for both post tests

	4 year olds				5 year olds				6 year olds			
	Immediate		Delayed		Immediate		Delayed		Immediate		Delayed	
	%	n	%	n	%	n	%	n	%	n	%	n
Dk	89	114	92.9	119	67.2	86	71.9	92	60.2	77	64	82
Irre	1	1	1	1	3.1	4	3.9	5	-	-	-	-
Sha	2.3	3	-	-	2.3	3	1.5	2	1.5	2	-	-
Ba	1.5	2	2.3	3	8.6	11	7	9	14.1	18	14.1	18
GiAna	6.2	8	3.8	5	18.7	24	15.6	20	24.2	31	21.9	28
N		128		128		128		128		128		128

Abbreviations: Dk=Don't know; Irre=Irrelevant; Sha=Shape similar word; Ba=Basic level word; GiAna=Given analogy

Appendix 5.22

Distribution of children's responses in the analogy task by linguistic condition for both post tests

	Inference				Analogy				Contrast				Definition			
	Immediate		Delayed		Immediate		Delayed		Immediate		Delayed		Immediate		Delayed	
	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
Dk	86.4	83	86.4	83	32.3	30	47.9	46	86.4	83	85.4	82	84.4	81	85.4	82
Irre	1	1	2.1	2	2.1	2	2.1	2	2.1	2	1	1	1	1	1	1
Sha	-	-	1	1	1	1	-	-	1	1	-	-	3.1	3	1	1
Ba	12.5	12	7.3	7	1	1	5.2	5	9.4	9	9.4	9	9.4	9	9.4	9
GiAna	-	-	3.1	3	63.6	60	44.8	43	1	1	4.2	4	2.1	2	3.1	3
N		96		96		96		96		96		96		96		96

Abbreviations: Dk=Don't know; Irre=Irrelevant; Sha=Shape similar word; Ba=Basic level word; GiAna=Given analogy

Appendix 5.23

Correlations (bivariate and partial) between children's age and performance on the contrast task for both post tests

	Contrast (I)	Contrast (D)
Age	.0676 (192) p=.176	.1377 (192) p=.028
Controlled for Vocabulary		
	.0621 (189) p=.197	.1441 (189) p=.023
Controlled for Memory		
	.0369 (189) p=.306	.0969 (189) p=.091

Abbreviations: I=Immediate post test; D= Delayed post test

Appendix 5.24

Distribution of children's responses in the contrast task by age for both post tests

	4 year olds				5 year olds				6 year olds			
	Immediate		Delayed		Immediate		Delayed		Immediate		Delayed	
	%	n	%	n	%	n	%	n	%	n	%	n
Dk	84.4	108	96.1	123	81.3	104	92.2	118	75.8	97	84.4	108
Ba	2.3	3	1.6	2	0.8	1	-	-	12.5	16	3.1	4
Gicon	13.3	17	2.3	3	17.9	23	7.8	10	11.7	15	12.5	16
N		128		128		128		128		128		128

Abbreviations: Dk=Don't know; Ba=Basic level word; Gicon=Given contrast

Appendix 5.25

Distribution of children's responses in the contrast task by linguistic condition for both post tests

	Inference				Analogy				Contrast				Definition			
	Immediate		Delayed		Immediate		Delayed		Immediate		Delayed		Immediate		Delayed	
	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
Dk	99	95	97.9	94	94.9	94	99	95	28.1	27	68.7	66	96.9	93	97.9	94
Ba	1	1	1	1	2	2	1	1	-	-	2.1	2	3.1	3	2.1	2
Gicon	-	-	1	1	-	-	-	-	71.9	69	29.2	28	-	-	-	-
N		96		96		96		96		96		96		96		96

Abbreviations: Dk=Don't know; Ba=Basic level word; Gicon=Given contrast

Appendix 5.26

Correlations (bivariate and partial) between children's age and performance on the sentence generation task for both post tests

	Sentence (I)	Contrast (D)
Age	.1388 (192) p=.026	.1377 (192) p=.028
Controlled for Vocabulary		
	.1500 (189) p=.037	.1441 (189) p=.023
Controlled for Memory		
	.1480 (189) p=.024	.1440 (189) p=.026

Abbreviations: I=Immediate post test; D= Delayed post test

Appendix 5.27

Distribution of children's responses in the sentence generation task by age for both post tests

	4 year olds				5 year olds				6 year olds			
	Immediate		**Delayed**		**Immediate**		**Delayed**		**Immediate**		**Delayed**	
	%	n	%	n	%	n	%	n	%	n	%	n
Dk	57	73	49.2	63	30.5	39	22.7	29	12.5	16	9.4	12
Idio	6.3	8	8.6	11	9.4	12	6.3	8	2.3	3	3.9	5
Perc	12.5	16	9.4	12	10.2	13	8.6	11	10.2	13	8.6	11
Func	21.9	28	32.8	42	43	55	57	73	60.2	77	70.3	90
Sem	2.3	3	-	-	7	9	5.5	7	14.8	19	7.8	10
N		128		128		128		128		128		128

Abbreviations: Dk=Don't know; Idio=Idiosyncratic properties; Perc=Perceptual properties; Func=Functional properties; Sem=Semantic properties

Appendix 5.28

Distribution of children's responses in the sentence generation task by linguistic condition for both post tests

	Inference				Analogy				Contrast				Definition			
	Immediate		Delayed		Immediate		Delayed		Immediate		Delayed		Immediate		Delayed	
	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
Dk	26	25	19.8	19	44.8	43	33.3	32	29.2	28	29.2	28	33.3	32	26	25
Idio	3.1	3	6.3	6	7.3	7	5.2	5	8.3	8	7.3	7	5.2	5	6.3	6
Perc	12.5	12	7.3	7	10.4	10	10.4	10	12.5	12	7.3	7	8.3	8	10.4	10
Func	52.1	50	62.5	60	32.3	31	45.8	44	42.7	41	53.1	51	39.6	38	52.1	50
Sem	6.3	6	4.2	4	5.2	5	5.2	5	7.3	7	3.1	3	13.5	13	5.2	5
N		96		96		96		96		96		96		96		96

Abbreviations: Dk=Don't know; Idio=Idiosyncratic properties; Perc=Perceptual properties; Func=Functional properties; Sem=Semantic properties

Appendix 5.29

Statistical comparison of children's performance between tasks during the Immediate post test

	Naming	M.choice	Inference	Analogy	Contrast	Definition	Sentence g.
Naming							
M.choice	Z=9.8 p<.0000						
Inference	Z=6.6 p<.0000	Z=6.1 p<.0000					
Analogy	Z=5.6 p<.0000	Z=10.8 p<.0000	Z=9.4 p<.0000				
Contrast	Z=6.4 p<.0000	Z=10.9 p<.0000	Z=9.6 p<.0000				
Definition	ns	Z=8.7 p<.0000	Z=5.6 p<.0000	Z=7.06 p<.0000	Z=7.01 p<.0000		
Sentence g.	Z=3.8 p<.005	Z=8.04 p<.0000	Z=4.5 p<.0000	Z=7.3 p<.0000	Z=7.5 p<.0000		

Abbreviations: Sentence g.= Sentence generation

Appendix 5.30

Statistical comparison of children's performance between tasks during the delayed post test

	Naming	M.choice	Inference	Analogy	Contrast	Definition	Sentence g.
Naming							
M.choice	Z=10.3 p<.0000						
Inference	Z=10.1 p<.0000	ns					
Analogy	ns	Z=9.7 p<.0000	Z=10.4 p<.0000				
Contrast	Z=4.1 p<.0000	Z=10.7 p<.0000	Z=10.9 p<.0000	Z=4.04 p<.0005			
Definition	Z=7.2 p<.0000	Z=4.9 p<.0000	Z=6.2 p<.0000	Z=8.11 p<.0000	Z=9.1 p<.0000		
Sentence g.	Z=8.1 p<.0000	Z=3.5 p<.0005	Z=4.4 p<.0000	Z=9.02 p<.0000	Z=9.6 p<.0000	Z=2.6 p<.05	

Abbreviations: Sentence g.=Sentence generation

Appendix 5.31

Correlations between children's performance on the multiple choice and naming task for both post tests

	Naming (I)	**Naming (D)**
M.choice (I)	.1356	.0551
	(192)	(192)
	p=.061	p=.448
M.choice (D)	.1253	.2081
	(192)	(192)
	p=.083	p=.004

Abbreviations: M.choice= Multiple choice; I = Immediate post test; D= Delayed post test

Appendix 5.32

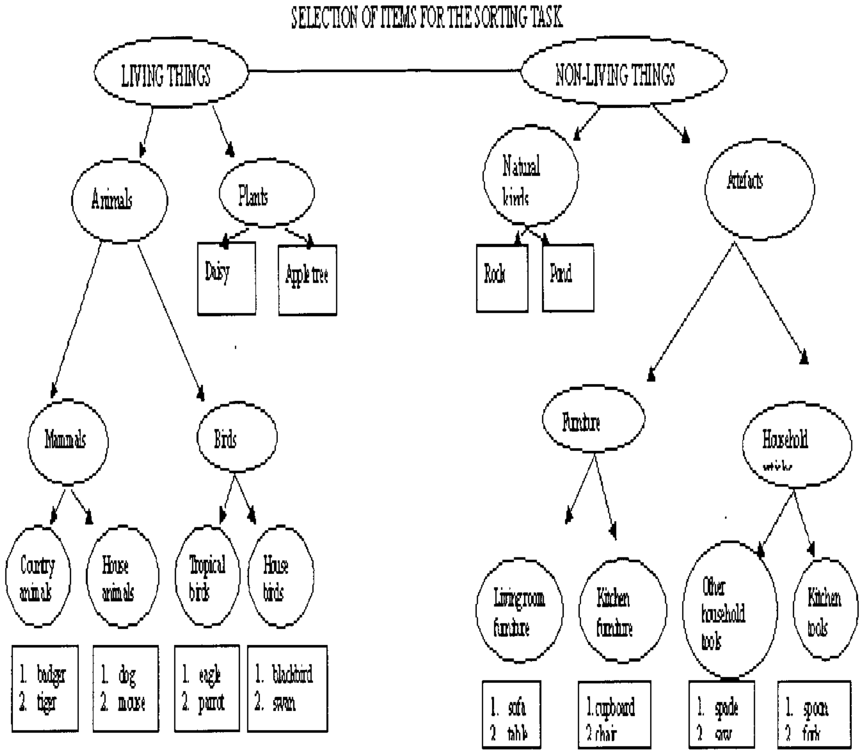
Correlations between children's performance on the naming and the other comprehension measures for both post tests

	Naming (I)		Delayed (D)
Inference (I)	.1145	**Inference (D)**	.0359
	(192)		(192)
	p=.114		p=.621
Analogy (I)	.2223	**Analogy (D)**	.1178
	(192)		(192)
	p=.002		p=.104
Contrast (I)	.1682	**Contrast (D)**	.1529
	(192)		(192)
	p=.020		p=.104
Definition (I)	.1328	**Definition (D)**	-.0157
	(192)		(192)
	p=.066		p=.829
Sentence (I)	.0731	**Sentence (D)**	-.0665
	(192)		(192)
	p=.313		p=.360

Abbreviations: M.choice= Multiple choice; I = Immediate post test; D = Delayed post test

Appendix 6.1

Selection of the items for the Association task



This diagram can be divided in to three levels:

Level A: It includes the Country and the House animals, Tropical and house birds as well as living room furniture and furniture, kitchen and other household tools.

Level B: It included mammals, birds, furniture and household articles.

Level C: It includes animals and artifacts.

Level D: It includes the living - non-living things.

Appendix 7.1

Screening Test

Comprehension task (List A)

Name: School:
Group: Date of Test: D.O.B.

PRACTICE ITEMS: rabbit, door, arm, house

TARGET WORDS	SCORE	RESPONSE
1. ladle		
2. bed		
3. zebra		
4. stool		
5. cow		
6. cup		
7. knife		
8. table		
9. wardrobe		
10. cushion		
11. tiger		
12. horse		
13. mole		
14. bowl		
15. vase		
16. elephant		
17. television		
18. ostrich		
19. bear		
20. camel		
21. dog		
22. deer		
TOTAL		

Comprehension task (List B)

Name: School:
Group: Date of Test: D.O.B.

PRACTICE ITEMS: rabbit, door, arm, house

TARGET WORDS	SCORE	RESPONSE
1. bear		
2. vase		
3. elephant		
4. stool		
5. wardrobe		
6. cushion		
7. ostrich		
8. dog		
9. camel		
10. bed		
11. ladle		
12. television		
13. bowl		
14. cup		
15. deer		
16. cow		
17. table		
18. mole		
19. tiger		
20. horse		
21. knife		
22. zebra		
TOTAL		

Comprehension task (List C)

Name: School:
Group: Date of Test: D.O.B.

PRACTICE ITEMS: rabbit, door, arm, house

TARGET WORDS	SCORE	RESPONSE
1. horse		
2. knife		
3. ostrich		
4. dog		
5. zebra		
6. wardrobe		
7. cow		
8. deer		
9. elephant		
10. cushion		
11. ladle		
12. stool		
13. cup		
14. tiger		
15. table		
16. vase		
17. mole		
18. bed		
19. bowl		
20. television		
21. camel		
22. bear		
TOTAL		

Comprehension task (List D)

Name: School:
Group: Date of Test: D.O.B.

PRACTICE ITEMS: rabbit, door, arm, house

TARGET WORDS	SCORE	RESPONSE
1. dog		
2. ladle		
3. television		
4. stool		
5. vase		
6. zebra		
7. camel		
8. tiger		
9. table		
10. wardrobe		
11. mole		
12. elephant		
13. knife		
14. cow		
15. horse		
16. bear		
17. cup		
18. deer		
19.cushion		
20. ostrich		
21. bed		
22. bowl		
TOTALS		

Comprehension task (List E)

Name: School:

Group: Date of Test: D.O.B.

PRACTICE ITEMS: rabbit, door, arm, house

TARGET WORDS	SCORE	RESPONSE
1. elephant		
2. bear		
3. ostrich		
4. cup		
5. knife		
6. cushion		
7. stool		
8. vase		
9. tiger		
10. television		
11. horse		
12. wardrobe		
13. ladle		
14. dog		
15. bed		
16. zebra		
17. table		
18. deer		
19. camel		
20. cow		
21. bowl		
22. mole		
TOTAL		

Naming task

Name: School:
Group: Date of Test: D.O.B.

PRACTICE ITEMS: ball, door, rabbit, house, tree, arm

TARGET WORDS	**SCORE**	**RESPONSE**
1. bear		
2. bowl		
3. cow		
4. cup		
5. deer		
6. elephant		
7. horse		
8. mole		
9. stool		
10. television		
11. vase		
12. bed		
13. camel		
14. cushion		
15. dog		
16. knife		
17.table		
18. tiger		
19. wardrobe		
20. zebra		
21. ostrich		
22. ladle		
TOTAL		

Appendix 7.2

Multiple choice plates

Plate for the ostrich (low frequency target word)

Target word ostrich	**Phonological foil** orange
Semantic foil Egyptian vulture	**Irrelevant foil** dart

Plate for the mole (high frequency word)

Target word mole	**Phonological foil** mop
Semantic foil badger	**Irrelevant foil** maize

Plate for the ladle (low frequency word)

Target word ladle	**Phonological foil** leaf
Semantic foil spoon	**Irrelevant foil** maize

Plate for the stool (high frequency word)

Target word stool	**Phonological foil** stork
Semantic foil chair	**Irrelevant foil** dart

Appendix 7.3

Text information

Ostensive definition session

ostrich: Look ! This is an ostrich (pointing at the picture).

mole: Look ! This is a mole (pointing at the picture).

ladle: Look! This is a ladle (pointing at the picture).

stool: Look! This is a stool (pointing at the picture).

Lexical contrast session

ostrich: Can you pass me the ostrich.? You see, the ostrich is different from a cockerel and a duck. The ostrich does not live in our homes but in the jungle. (*House animals # Jungle animals*)

mole: Can you pass me the mole ? You see the mole is different from a dog and a cat. The mole does not live inside the house but in the countryside. (*House animals # Countryside animals*)

ladle: Can you pass me the ladle ? You see the ladle is different from a nail and a hammer. You can find a ladle in the kitchen but not in the store. (*Kitchen tool # Other household tools*)

stool: Can you pass me the stool ? You see the stool is different from the armchair and the coffee table. You can find the stool in the kitchen not in the living room.(*Kitchen furniture # Living room furniture*).

Definition session

Ostrich:

(**Kind of**) The African ostrich is a large bird.

(**Description of it**) It has a flat head, and a long neck. It has long and strong legs, and unlike all other birds it has only two toes on each foot. It's body is covered with black feathers.

(**What it can do**) It can run very fast but it cannot fly. It can deliver vicious kicks if annoyed.

Mole:

(**Kind of**) The mole is a small mammal.

(**Description of it**) It has tiny eyes and dark fur. It has also a short tail and a movable sensitive snout. The front feet have developed almost into spades.

(**What it can do**) It is very good at digging. It digs tunnels in the ground.

Ladle:

(**Kind of**) A ladle is a household tool.

(**Description of it**) It has large a long handle and a round deep spoon.

(**What it can do/used for**) used for putting soup, stew, sauce etc. into bowls.

Stool:

(**Kind of**) A stool is a small furniture.

(**Description of it**) It has four legs but with no support for your arms or back.

(**What it can do/used for**) It is used for sitting.

Story reading session

Ostrich

Title: "One day in the jungle with the ostrich"

One day the <u>ostrich</u> , which is a jungle mammal, decided to get out from her house in the jungle and go for a walk . When she reached the middle of the jungle she saw many other birds flying up in the sky and laughing at her because although she was a bird she couldn't fly. Poor <u>ostrich</u>!! However, her friend the duck when she saw that she was unhappy, she tried to make her feel better. "Don't be sad" the duck said. I'll show you that you must be proud that you are an ostrich. The next day she organised a race among all the birds of the jungle. The rule was that they had to run till the end of the wood. The <u>ostrich</u> was very fast. Using her long strong legs she came first to the race. After that all the other birds stopped laughing at her, and asked her to be a friend of them.

Mole

Title: "One day in the field with the mole"

Tommy the mouse was enjoying the sunshine sitting out in the field. Suddenly, he saw small mounds of earth to be thrown up. For a moment he was very afraid. Then he listened someone calling him. "Hello Tommy" said the <u>mole</u>. "It's me ! Don't you remember me"? "Don't be afraid of all that fuss. "It's me the <u>mole</u>" the country mammal. " I was just digging tunnels under the ground because I like it". Tommy then recognised him. "Oh yes" he said, "It's you the <u>mole</u>, that you can dig anywhere you want because you have your front feet like spades". "Well-done!" said the mole. Then he went and sat next to Tommy and enjoyed the sun with him.

Ladle

Title: "One day with the ladle in the kitchen"

Mary and George decided to cook a special soup for their parents. One hour later the soup was ready . They invited their parents to sit on the table. Everybody was waiting to taste that excellent soup. Mary took a spoon to put the soup in the bowls. But the spoon was too small and it was taking her a lot of time. "Why don't you use the <u>ladle</u>?" said George. George took the <u>ladle</u> and said to Mary: Look Mary, the <u>ladle</u> is a kitchen tool especially designed for putting soup in the bowls, because it is a large round spoon, with a long handle. Mary used the ladle for putting soup in the bowls. Everybody enjoyed the nice soup.

Stool

Title: "One day with the stool in the kitchen"

Mum was cooking all the day because she wanted to make a surprise party for her son. At the end she got very tired. "I am going to sit down on that <u>stool</u> and have some rest" she said. She sat down in the <u>stool</u>, a kitchen furniture, that it was next to the cupboard in the kitchen. However, after a while, she felt that she could not rest properly because the <u>stool</u> didn't have any back for her back. So, she decided to go in the living room and sit in the big armchair they had. This was much more relaxing because she had a soft back for her back. When the children came back from the school, the found her asleep.

Appendix 7.4

Post Test Measurements for Experiment 2

Name: Date of Test:

School: D.O.B.

Group:

Naming task "What is this ?"

Target words	**Responses**
ostrich	
mole	
ladle	
stool	

Multiple choice task "Show me the x"

Target words	**Responses**
ostrich	
mole	
ladle	
stool	

Association task *"What goes best with the x ?"*

Target words	**Responses**
ostrich	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
mole	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
ladle	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
stool	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Short questions task

World knowledge questions	**Responses**
1. Can you find the x at the countryside ?	
2. Can you find the x in the kitchen ?	
3. Can you find the x in the jungle ?	
4. Can you find the x in the sea ? (distr)	
Categorisation questions	
1. Is it a kind of mammal ?	
2. Is it a kind of bird ?	
3. Is it a kind of household tool ?	
4. Is it a kind of furniture ?	
5. Is it kind of musical instrument ? (distr)	

If the answer in any of the questions is no then the child will be asked where can you find it? Or what is it?

Contrast task

ostrich

Question	**Response**
Can you say something which is different from the ostrich ?	

mole

Question	**Response**
Can you say something which is different from the mole?	

ladle

Question	Response
Can you say something which is different from he ladle?	

stool

Question	Response
Can you say something which is different from the mole?	

Definition task

ostrich

Question	Response
What do you think an ostrich is ?	

mole

Question	Response
What do you think a mole is ?	

ladle

Question	Response
What do you think a ladle is ?	

stool

Question	Response
What do you think a stool is ?	

Story generation task

Make up a story about the ostrich?

Make up a story about the mole ?

Make up a story about the ladle ?

Make up a story about the stool ?

Appendix 7.5

Children's response pattern (percentages) on the Naming task by group across testing

	Control			Phonol. control			Ostensive definition			Lexical contrast			Definition		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Dk.			29.8			18.3	29.8	22.1	9.6	28.8	21.1	10.6	25	5.8	3.8
Irr.			1.9			-	-	-	-	1.0	1.0	-	-	-	-
Pho.			3.8			3.8	7.7	5.8	9.6	5.8	8.6	4.8	7.7	9.6	3.8
Basic			31.7			25	20.2	25	17.3	14.4	10.6	15.4	14.4	12.5	1.5
Supe/te			1.0			1.9	-	9.6	10.6	-	-	1.0	-	0.1	0.1
Subo/te			1.9			1.0	-	1.0	1.0	1.0	-	-	-	-	0.1
Funct.			1.0			1.9	1.0	-	-	-	-	-	-	-	-
Context.			-			-	-	-	-	-	-	-	-	-	-
Percep.			-			-	1.9	-	-	-	1.0	-	-	-	-
Inno.			1.9			0.1	4.8	-	1.0	-	1.0	1.0	-	-	-
Target			26.9			47.1	34.6	36.5	50.1	49.03	56.7	67.3	52.9	71.1	78.8
N of responses			104			104	104	104	104	104	104	104	104104		104

Abbreviations: Dk = don't know responses, Irr= irrelevant responses, Pho.= phonological error responses, Basic= basic level responses, Supe/te = superordinate level responses, Subo/te= subordinate level responses, Funct.- functional responses, Context.= contextual responses, Percept.= perceptual responses, Inno.= innovative words, Target= target word responses; 1= Post test 1; 2 = Post test 2; 3 = Post test 3

Appendix 7.6

Children's response pattern (percentages) on the Multiple choice task by group across testing

	Control			Phonol. control			Ostensive definition			Lexical contrast			Definition		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Dk			3.8			3.8	4.8	2.8	1.9	1.0	-	-	-	-	-
Ph.			-			-	3.8	1.0	-	1.0	1.0	-	-	1.0	-
Sem.			10.6			7.7	-	3.8	1.9	3.8	2.9	2.9	1.9	-	-
Irr.			2.9			1.0	8.6	2.9	1.9	1.0	1.0	-	1.9	1.0	-
Target			82.7			87.5	82.7	89.4	94.2	93.2	95.1	97.1	96.2	98.1	100
N of responses			104	-	-	104	104	104	104	104	104	104	104	104	104

Abbreviations: Dk= Don't know responses; Ph: Phonological error; Sem: Semantic error; Irr= Irrelevant error; 1 = Post test 1; 2= Post test 2; 3= Post test 3

Appendix 7.7

Types of contrasts (percentages) provided in the contrast task by target word across testing

	Post test 1				Post test 2				Post test 3			
	O	M	L	S	O	M	L	S	O	M	L	S
Don't know	39.7	37.2	39.7	34.6	34.6	38.5	34.6	35.9	45.4	44.6	43.8	43.1
Animals	46.2	50	7.7	14.1	47.4	38.5	15.4	12.8	45.4	46.9	11.5	14.6
Cutlery	2.6	1.3	32.1	2.6	1.3	2.6	34.6	5.1	3.8	2.3	26.9	3.1
Furniture	3.8	3.8	7.7	41	6.4	12.8	2.6	39.7	2.3	1.5	4.6	29.2
Others	7.7	7.7	12.8	7.7	10.3	7.7	12.8	6.4	3.1	4.6	13.1	10
N of res.	78	78	78	78	78	78	78	78	78	78	78	78

Abbreviations: O=ostrich; M=mole; L=ladle; S=stool

Appendix 7.8

Correlations between children's performance on the Multiple choice and Naming task

	Naming 1	Naming 2	Naming 3
M.choice 1	.0117	.2282	.1955
	(78)	(78)	(78)
	p=.919	p=.045	p=.086
M.choice 2	.0009	.3427	.3156
	(78)	(78)	(78)
	p=.994	p=.002	p=.005
M.choice 3	-.0329	.2317	.3290
	(78)	(78)	(130)
	p=.775	p=.041	p=.000

Abbreviations: M.choice= Multiple choice

Appendix 7.9

Correlations between children's performance on the Naming and the other Understanding tasks

	Naming (1)	Naming (2)	Naming (3)
Association	.0396	.2006	.4156
(1) (2) (3)	(78)	(78)	(130)
	p=.731	p=.078	p=.000
Contrast	-.0073	.3714	.3134
(1) (2) (3)	(78)	(78)	(130)
	p=.949	p=.001	p=.000
Definition	.0688	.3567	.3984
(1) (2) (3)	(78)	(78)	(130)
	p=.549	p=.001	p=.000
World know.	.2703	.1307	.4271
(1) (2) (3)	(78)	(78)	(130)
	p=.017	p=.254	p=.000
Catego. Quest	-.0090	.2808	.3763
(1) (2) (3)	(78)	(78)	(130)
	p=.937	p=.013	p=.000
Story genera.	.0926	.3797	.3626
(1) (2) (3)	(78)	(78)	(130)
	p=.420	p=.001	p=.000

Abbreviations: World know.= World knowledge questions; Gatego. Quest.= Categorisation questions; Story genera. = Story generation questions

Appendix 7.10

Correlations between Existing vocabulary knowledge and performance on the Naming and Multiple choice tasks

	ExiCoVo	ExiNaVo
M.choice	.3197	.4107
Post test 1	(78)	(78)
	p=.004	p=.000
M.choice	.4574	.5545
Post test 2	(78)	(78)
	p=.000	p=.000
M.choice	.2045	.3014
Post test 3	(130)	(130)
	p=.020	p=.000
Naming	.2898	.2911
Post test 1	(78)	(78)
	p=.010	p=.010
Naming	.3766	.5361
Post test 2	(78)	(78)
	p=.001	p=.000
Naming	.2542	.4340
Post test 3	(130)	(130)
	p=.004	p=.000

Abbreviations: ExiCoVo= Existing Comprehension Vocabulary; ExiNaVo=Existing Naming Vocabulary; M.choice=Multiple choice

Appendix 7.11

Correlations between children's expressive and receptive vocabulary for animals and performance to the target words describing animals across testing

	ExiNaVoAni	ExiCoVoAni
Naming (1)	.3318 (78) p=.003	.3611 (78) p=.001
Naming (2)	.5218 (78) p=.000	.4181 (78) p=.000
Naming (3)	.4798 (130) p=.000	.3276 (130)p=.000
M.choice (1)	.4389 (78) p=.000	.4709 (78) p=.008
M.choice (2)	.4938 (78) p=.000	.5179 (78) p=.000
M.choice (3)	.2710 (130) p=.002	.2545 (130)p=.003
Definition (1)	.3496 (78) p=.002	.3002 (78) p=.008
Definition (2)	.4533 (78) p=.000	.3022 (78) p=.007
Definition (3)	.3743 (130) p=.000	.3093 (130)p=.000
Association (1)	.1871 (78) p=.101	.2501 (78) p=.027
Association (2)	.0791 (78) p=.491	.1572 (78) p=.169
Association (3)	.3150 (130) p=.000	.1630 (130)p=.064
Contrast (1)	-.0319 (78) p=.782	-.0319 (78) p=.782
Contrast (2)	.3417 (78) p=.002	.2002 (78) p=.079
Contrast (3)	.3129 (130) p=.000	.1616 (130)p=.066
Story (1)	.1040 (78) p=.365	.0716 (78) p=.534
Story (2)	.2214 (78) p=.014	.2771 (78) p=.014
Story (3)	.2883 (130) p=.001	.2843 (130)p=.001
Cat.qu.(1)	-.0293 (78) p=.799	.0947 (78) p=.410
Cat.qu.(2)	.3078 (78) p=.006	.2727 (78)p=.016
Cat.qu (3)	.3343 (130) p=.000	.2542 (130)p=.004
Wk.qu.(1)	.3315 (78) p=.003	.1214 (78) p=.290
Wk.qu.(2)	.1500 (78) p=.190	.1170 (78) p=.308
Wk.qu.(3)	.3652 (130) p=.000	.2055 (130)p=.019

Abbreviations:ExiNaVoAni= Existing Naming Vocabulary for animals; ExiCoVoAni=Existing Comprehension Vocabulary for animals; M .choice. = Multiple choice; Cat.qu= Categorisation question Wk.qu= World knowledge question; (1)=Post test 1; (2) Post test 2; (3)=Post test 3

Appendix 7.12

Correlations between children's expressive and receptive vocabulary for artifacts and performance to the target words describing artifacts across testing

	ExiNaVoArti	ExiCoVoArti
Naming (1)	.1863 (78) p=.102	.2061(78) p=.070
Naming (2)	.2716 (78) p=.016	.1985 (78) p=.081
Naming (3)	.2255 (130) p=.010	.1057 (130)p=.232
M.choice (1)	.1491 (78) p=.193	.1346 (78) p=.240
M.choice (2)	.1727 (78) p=.131	.1310 (78) p=.253
M.choice (3)	-.1522 (130) p=.084	.0698 (130)p=.430
Definition (1)	.0767 (78) p=.504	-.0517 (78) p=.653
Definition (2)	.1920 (78) p=.092	.2713 (78) p=.016
Definition (3)	.2227 (130) p=.011	.117 (130)p=.182
Association (1)	-.0717 (78) p=.533	.1166 (78) p=.309
Association (2)	.1976 (78) p=.083	-.858 (78) p=.455
Association (3)	.1722 (130) p=.050	-.0168(130)p=.849
Contrast (1)	.1421 (78) p=.215	.1278 (78) p=.265
Contrast (2)	.1427 (78) p=.213	-.0160 (78) p=.889
Contrast (3)	.0729 (130) p=.410	-.1871(130)p=.033
Story (1)	.2408 (78) p=.034	-.0071 (78) p=.950
Story (2)	.0998 (78) p=.385	.0765 (78) p=.506
Story (3)	.1551 (130) p=.078	.1031(130)p=.243
Cat.qu.(1)	-.0015 (78) p=.990	.1672 (78) p=.143
Cat.qu.(2)	.1201 (78) p=.295	.1929 (78)p=.091
Cat.qu (3)	.1525 (130) p=.083	.1912 (130)p=.029
Wk.qu.(1)	.0839 (78) p=.465	-.0015 (78) p=.989
Wk.qu.(2)	.1965 (78) p=.05	.0774(78) p=.501
Wk.qu.(3)	.3944 (130) p=.000	.1974 (130)p=.024

Abbreviations:ExiNaVoArti=Existing Naming vocabulary for artifacts; ExiCoVoArti=Existing Comprehension Vocabulary for artifacts; M.choice.=Multiple choice; Cat.qu= Categorisation question Wk.qu= World knowledge question; (1)=Post test 1; (2)=Post test 2; (3)=Post test 3

Appendix 7.13

Statistical comparison of children's performance between tasks during post test 1

	Naming	M.choice	Association	Contrast	Story generation	Definition	Sh. Qu. WK	Sh.Qu CA
Naming								
M.choice.	Z=6.7 p<.0000							
Association	Z=4.6 p<.0000	Z=3.9 p<.0005						
Contrast	ns	Z=6.4 p<.0000	Z=5.03 p<.0000					
Story generation	ns	Z=6.5 p<.0000	Z=5.04 p<.0000	Z=2.2 p<.05				
Definition	ns	Z=6.1 p<.0000	Z=3.8 p<.0005		Z=3.1 p<.005			
Sh. Qu. WK	ns	Z=6.9 p<.0000	Z=4.9 p<.0000					
Sh.Qu CA	Z=5.7 p<.0000	Z=7.6 p<.0000	Z=7.2 p<0000	Z=5.2 p<0000	Z=3.8 p<0005	Z=6.2 p<0000	Z=5.8 p<0000	

Abbreviations: M.choice. = Multiple choice; Sh.qu. WK = World knowledge Short question; Sh.qu CA = Categorisation Short question; ns=not significant

Appendix 7.14

Statistical comparison of children's performance between tasks during post test 2

	Naming	M.choice	Association	Contrast	Story generation	Definition	Sh. Qu. WK	Sh.Qu CA
Naming								
M.choice.	Z=6.6 p<.0000							
Association	Z=5.2 p<.0000	Z=3.3 p<.005						
Contrast	Z=2.8 p<.005	Z=6.6 p<.0000	Z=5.8 p<.0000					
Story generation	Z=3.4 p<.005	Z=6.6 p<.0000	Z=6.1 p<.0000					
Definition	Z=1.9 p<.05	Z=5.4 p<.005	Z=3.4 p<.0005	Z=4.2 p<.0000	Z=4.5 p<.0000			Z=5.08 p<.0000
Sh. Qu. WK	Z=1.9 p<.05	Z=6.4 p<.0000	Z=4.3 p<.0000	Z=4.2 p<.0000	Z=4.1 p<.0000			Z=4.7 p<.0000
Sh.Qu CA	Z=3.7 p<.0005	Z=7.1 p<.0000	Z=6.7 p<.0000					

Abbreviations: M.choice. = Multiple choice; Sh.qu. WK = World knowledge Short question; Sh.qu CA = Categorisation Short question

Appendix 7.15

Statistical comparison of children's performance between tasks during post test 3

	Naming	M.choice	Association	Contrast	Story generation	Definition	Sh. Qu. WK	Sh.Qu CA
Naming								
M.choice.	Z=8.3 p<.0000							
Association	Z=5.2 p<.0000	Z=5.1 p<.0000						
Contrast	Z=4.03 p<.005	Z=8.2 p<.0000	Z=6.9 p<.0000					
Story generation	Z=5.2 p<.0000	Z=8.6 p<.0000	Z=7.5 p<.000					
Definition	Z=3.7 p<.0005	Z=6.6 p<.0000	Z=1.9 p<.0000	Z=5.8 p<.0000	Z=7.2 p<.0000			Z=7.3 p<.0000
Sh. Qu. WK	Z=3.9 p<.0005	Z=7.2 p<.0000		Z=6.3 p<.0000	Z=7.6 p<.0000			Z=8.1 p<.0000
Sh.Qu CA	Z=5.5 p<.0000	Z=9.1 p<.0000	Z=7.9 p<.0000					

Abbreviations: M.choice. = Multiple choice; Sh.qu. WK = World knowledge Short question; Sh.qu CA = Categorisation Short question